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ABSTRACT

This report contains speeches and notes of workshop participants meeting to discuss improvement of the design and construction of elementary and secondary school facilities. Participants included educators, architects, engineers, and contractors. Twenty-two selections cover such topics as planning coordination for school construction, cost control on school design, the computer as a teaching aid, and construction systems. The desirable characteristics of special facilities for physical and health education, music education, media centers, and learning material centers are outlined. Related documents are EA 002 877, EA 003 049, and EA 003 050. (Pages 25-29 may reproduce poorly because of marginal legibility.) (MLF)

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group reports
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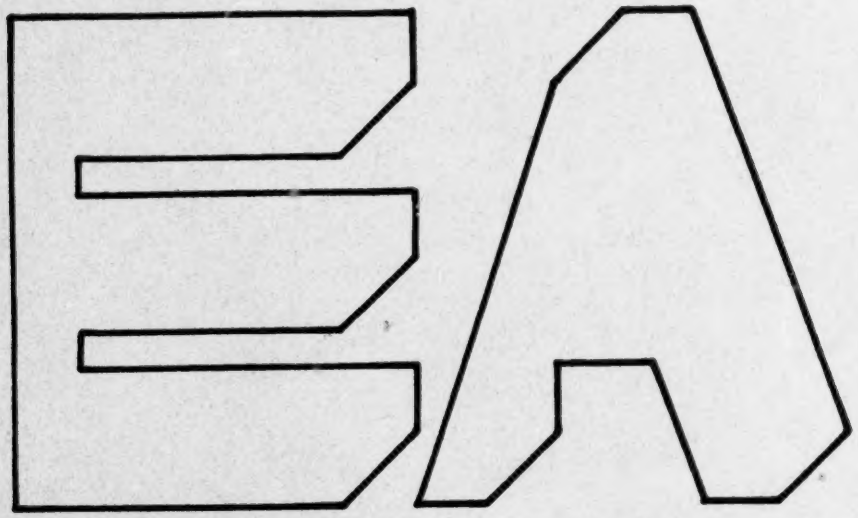

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Education and Architecture in the 20th Century: the fourth of a new series of School Design Workshops held at the Rock Haven Motor Hotel, Peterborough, Ontario

March 25th - 26th, 1969

The Ninth Regional School

Design Workshop was held in

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The attached speeches and

notes are exact copies of

material received from

participants at the

completion of the Workshop

SCHOOL PLANNING AND BUILDING

RESEARCH SECTION

ONTARIO DEPARTMENT OF EDUCATION

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OPENING ADDRESS by Mr. S.T. Orlowski

I wish to welcome all the participants from the eastern part of our Province, other parts of Canada and from the United Kingdom. Some of you Ladies and Gentlemen participated in our previous Workshops and some are taking part in our endeavours for the first time.

In past years we have held similar conferences that brought together school trustees, educators, board officials, engineers, architects and contractors. Various papers were presented and discussions were held, opinions expressed regarding elementary, secondary and post-secondary schools. Our present Workshop is dedicated to elementary and secondary school design.

Any school design is a challenge, both for educators and architects, because we all realise that schools that are being built today have to outlast the present time and still function well in the future. We must always bear in mind this simple truth, namely that our children are citizens of this world and of the world to come.

We are on the threshold of a brand new century. We are witnessing a tremendous development in the technical world. But let us not be blinded by conquers of science alone. Although we marvel at computers and interplanetary exploits, and these I admit are great achievements, we must not forget that there are parallel achievements in other fields - the new philosophy is born to govern our lives and to prepare us for all these new things and ideas.

"The schools must project an educational philosophy that emphasizes learning, flexibility and continuity, and that instills in the student's mind an awareness of impending social and economic change. It must also encourage the students to obtain maximum benefit from their educational experience by exposure to other disciplines and hence to an understanding of their interrelationship."

It sounds like a big order, but in view of the findings of the Provincial Committee on Aims and Objectives of Education in Schools of Ontario - this order can be filled. "The 220 - page report reflects the new mood in education in which it is the responsibility of every school authority to provide a child-centred learning continuum that invites learning by individual discovery and inquiry."

The world never stood still, but we never had to cope with so many changes in such a short time. Let's hope that we are moving at present towards a better and happier world and not to destruction of whole humanity. The new world belongs to the new generation, but we will be held responsible for this generation. We must do our best. And when we do all we possibly can, let's hope for the best.

And a small request to wind it up - I expect the full participation of all present and please do not feel intimidated - express your views freely. Only this will give us the assurance of some positive results.

CURRENT REGIONAL EDUCATION NEEDS by Mr. R.W. Froats

It is indeed a pleasure for me this morning to welcome to Region 9 a cross-section of our people who are here with a united purpose to improve the design and construction of our school facilities.

In this respect, on your behalf, I would like to take this opportunity of thanking Mr. Orlowski and the officials of the Department of Education's School Planning and Building Research Section for making this Workshop available to the Region.

The Ontario Institute for Studies in Education has asked the question: "Where are ideas to come from in planning the design of a school and its total environment?"

Changes in educational ideas and procedures, and new concepts come from a variety of sources; at the important grassroots of the system, teaching personnel will repeatedly perceive problems and look for answers. Their contribution is a remarkable one in the field of action research leading to acceptable changes regarding facilities to house new teaching aids and teaching techniques. Teachers should always be consulted when new facilities or changes in facilities are being considered.

Then, of course, we must recognize that changes come from without as well as from within. The alert trustee soon becomes aware of new developments in educational techniques, and in order to establish policies regarding financial arrangements, structural and design possibilities, he looks for assistance from the professional group of architects, engineers, and contractors to bring the project through its various stages to completion.

In summary then, we conceive of a great team, composed of researchers, educators, architects, engineers, contractors, all of whom I suspect are represented in this gathering this morning.

The prime interest of each of us in our presence here this morning and for the next two days is to consider ways and means of providing the most efficient and practical facilities to assist in the best education for our boys and girls of Ontario.

As kick-off speaker therefore, I am now going to take advantage of my allotted time to summarize for you the changing approach to learning over the past few years. From a study of the learning conditions we establish our building requirements and our overall plans for the region.

The learning situation in to-day's classroom, particularly at the primary level, provides marked contrasts with that of yesteryear. It is much less formal, less rigidly structured, less tense, less teacher dominated. Group teaching and individual learning programs centred around interests, are used frequently to supplement and replace instruction of the entire class. The teacher motivates, suggests problem areas for investigation, asks some key questions, arouses an interest, guides, provides resources for obtaining information, and generally facilitates the pupils of the group in their inquiry. The pupils observe, do, handle, feel, experiment, question, discuss, debate. They are not quiet, passive, submissive. They, instead of the teacher, do most of the asking, talking, responding, reacting, doing. The learning is often cast in a game situation, especially in the primary grades, and there is laughter and good fun. When a child begins to play games with things that stand for other things, he enters the gateway to reason and imagination. Learning needs not be painful nor always serious. Certainly children in their learning seem happier, more relaxed, more eager to inquire and to discover than they were a few years back, and this is as it should be. It is evident too that, in such a climate, they accept more responsibility for their own learning, and are more self-directing and more sensitive to life about them, than ever before.

The process of learning is stressed, rather than the memorization of a catalogued set of facts. Some facts in mathematics, science vocabulary etc. must, of course, be committed to memory, but need to be learned, not in a vacuum, but in a total context related to one's needs, to the task in hand, and to using those facts. There is increasing recognition that concepts of the abstract can be developed only on a foundation of direct experience with the concrete. To this end teachers are providing for interest centres in

their classrooms, for field trips and excursions and for experimentation. These spark inquiry and research through use of library, films, laboratory, and provide the stuff on which other concepts and language are built.

In certain respects the above remarks perhaps apply more to the elementary school than to secondary. However, in the high school too there is increasing use of group instruction, of the seminar approach, of learning by discovery, of doing rather than trying merely to soak up, of much more pupil involvement, of more flexibility in courses of study. Also there is growing acceptance that all students in a grade need not cover the same work in all subjects, but that a group or even an individual should be permitted to investigate a topic or unit of work in which he has particular interest, at great depth, and omit others completely. The number of obligatory subjects is decreasing and the list of optional ones from which the student may choose in accordance with his interests, is increasing. In the elementary panel and also in the secondary, there is a changing emphasis on examinations. The tendency is to reduce the number and length of formidable term examinations, to rely more on short tests and continuous assessment, and to use tests more as diagnostic instruments to indicate where more teaching and learning is needed, rather than as hurdles for failing pupils.

Schools are placing more responsibility for self-direction and self-determination on all pupils, but particularly at the more senior levels, and students are in general, responding positively. The success of the Senior Plan in the secondary schools, is clear evidence of this. There is a growing demand amongst senior students that they be treated more as partners in the educational enterprise and that they be given some voice in discipline, curriculum and in organization. It would seem that their vast potential might well be utilized in dealing with some of these matters and that their opinions would frequently be useful. The 'Forum' device initiated in many secondary schools, is a promising approach to this proposition. Such means as this, will assist in developing in a student a sense of responsibility--a two-fold responsibility, to himself and to society--which will cause him to use his talents in such a way as best to serve his fellow-man. And that is what education in a democrary is all about!

In the past ten years we have witnessed a most exciting era in the development of educational methods and procedures in Ontario. To meet the changing conditions as outlined above, we have experimented in Ontario in many new fields such as:

(a) The Junior Kindergarten
(b) Kindergarten proper
(c) Discovery approach to learning
(d) The ungraded elementary school
(e) Subject promotion in the secondary field
(f) The extensive use of audio-visual aids and total immersion
(g) Team teaching
(h) Individual timetabling
(i) Seminar teaching
(j) The development of television
(k) The provision of psychological services
(l) Special education for the handicapped
(m) The outward bound programs - use of resources of the community
(n) The provision of teaching-aids & resource centres.
(o) Special vocational schools
(p) Community use of schools
(q) Summer school for acceleration

I have purposely omitted the use of the computer as an individual instructional technique for the average school. It is my belief that it will remain in the experimental field for at least the next ten years.

Now, ladies and gentlemen, to take stock, we are entering an era in education when we have the following realities:

(a) A wealth of tested innovative ideas for the improvement of instruction in our schools.
(b) In the new County Board of Education System of Administration, the means whereby any or all these ideas are now educationally and economically feasible.
(c) According to the winds of rumour from all levels of government, we are entering what we hope is only a mild degree of economic austerity.

In the light of these realities and at the risk of being termed reactionary, I would like to see us enter a period of "temporary" stability in which we might be given an opportunity to develop and consolidate our gains of the past decade. Change we need, but "change of change" and change for the sake of change could easily lead us into chaos.

During the past 20 years we have witnessed a tremendous period of expansion and change in all sectors of our economy. Yes, and apparently even to the extent of expansion beyond the extent of our resources. We are not alone in education, we now see all levels of government obliged to "batten the hatches" and cool the fires of an over-stimulated race for progress and change.

Let us consolidate our gains and be prepared to advance when reasonable stability in all sectors of the economy is established once again.

Finally, how do we summarize our message to those of you who are responsible for the provision of school facilities. With the miriad of ideas for improved methodology, it is certain that we are unable to generalize. In the final analysis, our purpose is to build facilities to meet the needs of the programs offered in the school area. It is the responsibility of the educators to determine the best programs to be offered in the school, for the trustees to determine policy and provide finance, and for the architects, engineers and contractors to come up with the plans for the provision of adequate facilities at a cost which can be covered by the resources available.

CURRENT REGIONAL EDUCATION NEEDS AND THE MASTER PLAN FOR OUR FUTURE by Mr. F.H. Hogle

Mr. Chairman and ladies and gentlemen; Mr. Froats has discussed with you the new dimension of educational administration - the larger unit for school organization and some of the things we should look forward to as a result. His remarks have been aimed at giving perspective and breadth to this conference. My role, then, as I see it, is a bit more myopic: now that we are aware of the new and broader vistas opened up by the educational reorganization to focus upon the educational process as it takes place in the learning situation.

In ancient times there lived in the north of Greece, King Midas, who was greedy for gold - so greedy in fact that he wished that everything he touched should turn to gold. Dionysus, the god of wine, in return for a favour done, granted the request. Midas made use of his power to turn his furniture and a twig from a tree into gold. Delighted with his gift, he kissed his daughter only to find that she became a golden statue - the gift which he had asked for had destroyed the one whom he loved most.

Perhaps from this there is a lesson to be learned for those of us involved in education.

We know that schools exist for children - and must therefore be child-centred. If ever we have operated any other type of system we have been wrong. Who is this child who we are to educate, and what is our purpose?

If the Keiller-McKay Report on Religious Education had not already been published, I suppose I could say that the writer of Genius has already answered my two questions:

> "And God created man to his own image: to the image of God he created him: male and female he created them".

God made man <u>in his own image</u>...each with a touch of the divine.

"And God blessed them saying: Increase and multiply and fill the earth and subdue it".

Now I sometimes think that man has become so absorbed in the first half of this command - in the increasing and multiplying - in procreation - that he has neglected the second half - i.e. "the subduing of the earth". We should note that God has given the earth and its resources to man - and man is to probe the earth, to make it yield us its secrets, to make it serve him.

Now it would be a cruel thing to give a man a task and no weapon to accomplish that task. Man's weapon is his intellect - his mind. We learned a bit about how it works in our courses in psychology during our teacher training. It was a theoretical approach - descriptive - telling us how the child learned. But I think we should note the new psychology that is abroad as set forth by Dr. Maltz in his Psycho-Cybernetics and Dr. Hart in his Autoconditioning. This new psychology - is not only descriptive but also prescriptive - it does not tell us what happens but how to make it happen.

Dr. Maltz tells of three groups of golf players: the one group practised to improve their scores, the second group did not practise, and the third group practised at home in their armchairs - they pictured the ball on the tee, the swinging club, the impact of ball and club, the soaring ball, and the hole-in-one - all in their armchairs. It is to be expected that the group which practised should improve - and they did by 24%. It is to be expected that the group which did not practise should not improve - and they didn't. But what of the armchair practisers - the one who engaged in only imagining? They improved almost as much as those who actually practised - 23%.

In short an idea impressed on the mind is a powerful thing. To put it differently: what we think we are is more important than what we actually are...for we become what we think we are. The girl who pictures herself as unsuccessful, as a wall flower, will remain just that. Teachers must then become more active in helping students to improve their self-image - to picture themselves as they should be, to re-picture themselves as they would like to be...and, if repeated often enough, that they will become.

Such is the child then: a being made to the image and likeness of God with a tremendous capacity for fulfillment in terms of the images that are fed into his mind.

And the divine command to this child is to subdue the world. But before one can subdue the world he must know the nature of that world.

A world full of impact impinges and must be made to impinge upon the child. I suppose those of us who are engaged in education must at times shield the child from his environment in order to ensure that confusion does not result from a multiplicity of sensations. But a child must experience his world - first hand out of the classroom: on field trips to study the flight of the hare before the pursuing fox, on visits to the maple syrup bush to watch the bubbling sap, on tours of the countryside to come to appreciate the resources of his country. But it is not practical - nor is it desirable - that he experience everything first-hand. There is a place for vicarious experiences - to taste them second hand. In the classroom, in the lecture hall, in the auditorium, - through the film, the slide, the taperecorder, the record, the picture - to experience that world as it existed in the past and as it exists now: on one side Daedulus, the carpenter of ancient Cute, who made wings of feathers for himself and his son Icarus and fastened them on with wax - on the other three astronauts spending Christmas orbiting the moon; on one side Pericles consoling the Athenian parents bereaved of sons during the Peloponnesian war - on the other, a woman who has been widowed in Vietnam; on the one side the ancient Egyptians building their tombs with slave labour, hauling 2½ tons rock up the side of the pyramid - on the other the modern builders, with cranes fitting steel girders into place high above the city street.

In short I suppose the role of the school is very simple - that of setting up a connecting link between the child and global village in which we live. In this whole picture the teacher plays a vital role: her role is not so much that of a dispenser of facts - as it has been in the past. Rather she makes use of the technology - the software and the hardware, if they can do as successful or even

more successful job than she can - a film to teach the geography of Africa, a record of Maurice Evans in the role of Shakespeare's "Hamlet", a visit to the museum to see Eskimo life, a taperecording of the recent visit to the city council.

And therefore is the teacher obsolete? Can her place be taken by a technician who presses buttons, changes film, splices tape. No - but her role is altered: she is not so much a purveyor of facts, but rather a helper of children in the analysis, the interpretation, the criticism of facts:

The recently published Keiller MacKay Report on Religious Education shows the teacher's role. The class has studied Allen Sullivan's story of the Indian half-breed who had dragged a toboggan laden with food through a blinding storm....starving. The discussion - teacher led - centres around the moral question of whether the half-breed would have been justified in eating the food which did not belong to him. The facts are put across, somehow, but it is the teacher who performs the highly skilled task of leading - or guiding - better perhaps of training children to guide - the discussion.

Any yet in all that I have talked about - there is - danger.

One can build a self-image that can enhance, endow...as when one helps a child to appreciate the beauty of a tender snowflake - or one can build a self image than can destroy, brainwash. One can use technology that teaches geography and history - but can also teach hatred, violence, racial discrimination and intolerance,

And so.....

Midas turned his daughter whom he valued most into a cold, unyielding golden statue. We who place our faith only in prescriptive self-image psychology, and cold technology can do the same with our children - turn them into fact-carrying robots. The very technology that can lead to heaven can also consign to hell. The teacher, however, with her warmth of personality, her human qualities can develop a proper atmosphere for her pupils and bring out the insight into human problems.

And how then does all this -

- the child made to the image of God,
- the divine command to subdue the world,
- the value of the self-image,
- the technology of education,
- the teacher as a skilled professional,

how does all this fit into a conference on school design?

I recall a Director of Education who was asked his philosophy of education - it should be noted that he was coping with a burgeoning school population - smiled and replied - "My philosophy is to get them in out of the rain."

Well, in every pragmatic terms the education process in our northern climate must at times be brought in out of the rain - and I may add in out of the snow, the sleet, the zero weather.

We will be talking about school design at this workshop, but let's remember that we design schools in which the central figure is the child in contact with his environment and reacting thereto.

Schools must never be
- monuments to architects
- memorial to board members

but rather homes where God-given talents may have an opportunity to develop under the guidance of thoughtful teachers.

Such is the task - such is the challenge we face today and tomorrow.

PLANNING COORDINATION FOR SCHOOL CONSTRUCTION by Mr. W.F. Thom

I am pleased to be participating in this conference because I am so enthusiastic about the opportunities given to the new county Boards of Education. They have been challenged with the task of creating equality of opportunity for their elementary and secondary school pupils within their several jurisdictions and jointly across the province. This lofty objective should be approached not by strengthening the weak schools at the expense of the strong but by striving to improve the best schools and, at the same time, accelerating needed changes in the others.

This conference, I believe, will confine its deliberations to one aspect of the challenge--the provision of good accommodation for the pupils and the steps that each Board should consider in order to achieve it.

In many counties, the Interim School Organization Committee, which did such valuable preparatory work for the County Boards, studied existing accommodation and future needs and devoted a section of its report to its findings and suggestions. It is to be expected that this section will be examined and considered carefully but that the new Boards will wish to conduct their own studies, keeping in mind the broad aspect of their responsibility and being mindful of all advice available to them. Such studies may well result in fewer but larger schools with elimination of municipal boundaries in favour of natural lines.

To establish future secondary school needs, enrolments in the feeder elementary schools are available and should be studied in conjunction with retention patterns developed in the secondary schools. Elementary enrolments can be forecast from numbers in the present grades together with figures for pre-school children which are available from municipal clerks or county health units. Industrial development may result in an immediate substantial increase in elementary figures but corresponding increase in the secondary population will be deferred for several years. In all cases, additions or new schools should be planned to meet accommodation needs for five years from the date of completion substantial building programs for secondary school purposes require two years to plan and implement.

When the number of new pupil-spaces to be provided has been established and the location of the addition or new school has been determined, details of the type of program to be offered must be considered. Visits to new schools in other counties are strongly recommended for board members, administrative personnel, teachers, and others who will be offering advice. New concepts in school design should be studied. In the case of secondary schools, advisory vocational committees, perhaps with co-opted members, should be active. Involvement of interested lay and professional people is highly desirable. When the essential features have been tentatively agreed upon, a Building Proposal should be submitted to the Regional Business Administrator. On acceptance, the Board will be advised of the amount of departmental grant that can be expected if the building program is completed. At this point, many Boards feel that the advice of an architect is essential, although departmental policy discourages the selection of an architect at this juncture. The Board may estimate the cost of the building on the basis of the number of square feet, allow for furniture, architect's fee and school site, if applicable, and hence determine the debenture that will be required. The Municipal Board must then agree to let the Board issue debentures up to this amount if the project is to go ahead. Many Boards have been able to finance new construction at attractive borrowing rates through the Ontario Educational Capital Aid Program but this source has become inadequate to satisfy recent demands on it.

An architect may now be engaged with the blessing of the Department and sketch plans may be developed and presented to the Department for approval or revision. Final plans and specifications will then be prepared and submitted to the Department and through it to the Provincial Fire Marshal's Office. When all steps are approved, grants are recalculated, and tenders may then be called. If the most attractive bid is within the amount previously approved by the Municipal Board, financing arrangements will be verified and, if satisfactory, a contract may be signed.

The planning stages may be expected to extend over a twelve-month period and major construction contracts will require a year to complete.

As construction proceeds, the architect should approve every step in the contract. Frequency and quality of supervision are important to the final result and should be negotiated with the architect when he is engaged. Channels of communication between the Board and the contractor should be through the architect Education officials on the spot should convey requests for minor revision of plans to the Board for action--only the architect authorizes or directs the contractor to revise plans or specifications. Progress payments will be made to the contractor as the architect authorizes. A percentage hold-back is intended to ensure prompt attention to the correction of deficiencies that may become apparent in the new building. When all corrections have been carried out and the time specified for hold-back has expired, the Board should direct its solicitor to ascertain if the building is free of liens, and, if so, it should then pay the balance of the contract. The responsibility of a conscientious architect does not end here, he will continue to investigate and advise when new problems come to light. In fact, if a problem presents itself because of faulty design, the architect and not the Board should bear the cost of correction.

With the employment of experienced administrative officials having backgrounds in education, Boards should look first for features in their building programs that are desirable from an educational point of view then they should select the architect who can best incorporate these features. Too often in the past, the architect looked for this advice, and when he did not receive it, he was forced to rely on his technical knowledge and experience.

Boards should expect their administrations to be constantly alert to trends and projected needs. School sites should be reserved as subdivisions are planned. Five-year projections of capital needs should be as accurate as possible to avoid future delays in obtaining Municipal Board approval for building projects. Grant regulations should be studies in order to enable Boards to take maximum advantage of their provisions.

With the cost of amortizing twenty-year debentures more than double the original debenture, should Boards consider their potential to build small schools and modest additions from current funds?

To reduce delays in obtaining building project approvals, could the Department of Education and the Municipal Board agree in advance on the amount that each County Board of Education would be permitted to debenture in each of the ensuing five years?

If our educational planning is to show continued progress, no school will ever be built that will completely satisfy the aspirations of those who will labour in it.

PLANNING CO-ORDINATION FOR SCHOOL CONSTRUCTION by Mr. A.J. Connidis

The popular magazine description of the architect is often given as the "creator of buildings" or "the moulder of our cities" "shaper of our environment" and similar exotic titles. No doubt several contractors and engineers could provide other names, but really I think the architects' main task in this fluid society of ours is that of an imaginative co-ordinator. I don't think the grandiose titles have ever been his, or actually claimed by him.

It is the man who successfully exploits a potential source of weath, or the man with an idea, such as the automobile or aeroplane, who creates the demands and ensuing need for labour and accommodation. This need has to be met and ultimately may require the service of an architect.

Lest I sound too humble, there is quite a special skill involved in enclosing a space, not least of which is the ability to visualize something in three dimensions and living colour before it exists, and then to get the man who is paying for it together with a whole group of fellow specialists, to share your vision and help make it work. Nevertheless a space use problem must first be presented to the architect and it is then his direct responsibility to translate it into a physical form.

Up to the time someone says "We need an eighteen room school right here and the price must not exceed so many dollars" several people may have already been involved, often excluding the architect. This is an undesirable situation when a potential source of skill is not used. If an architect has been engaged to design a school, or any other type of building for that matter, he should be called upon to advise in the preparation of design briefs and to study master plans in order to select a site.

Too often we are asked to add to a building which was not designed for it's ultimate capacity on a site which is unsuitable and may be regularly flooded by the spring run-off.

Here then is the first task of planning co-ordination, that of land use. Let us avoid placing a school on a main highway if we can, it has happened and children have been hurt because of it.

The school site can form the nucleus of a community, for example, a school in a centrally located park providing vistas of trees and open grassy area, with perspectives of streetscapes which may otherwise be lost. Such siting may form the basis for expansion into a community complex when the school building may offer facilities for community use or in conjunction with adjacent communal buildings, such as ice rinks, swimming pools, theatres and even shops. This sort of planning will surely lead to a more economical use of public funds.

From the site to the building. Given a basic accommodation requirement, let us talk to one another before we design anything. Let us hear the voices of responsible board members, Directors of Education, Area Superintendents, school principals, teachers, maintenance men, and also students. It is often a conflicting voice, sometimes a tirade, but never one without enthusiasm. It is a voice of many different experiences, and changing requirements which must be heard, and it is the architects' responsibility to try and make sure that it is.

The architect must analyse the demands, consider the suggestions, study the criticisms as objectively as possible, study user occupation of existing buildings, and establish a rapport between owner, user and designer. Then follows a synthesis into a design for a building which will happily meet all structural, atmospheric, aesthetic and financial requirements as interpreted by the architect and his consultants working as a co-ordinated planning team.

During the planning process we need to look continuously at our latest ideas already incorporated into existing schools and see how they are working out, and to see if manufacturers' products are living up to their promise It is very easy to repeat an attractive new experiment in the name of the "latest thing". Ask yourself the following questions:

Are fully carpeted floors the best thing for kindergartens? They are nice to sit on, nice to sleep on, quiet, pretty, reasonable for normal maintenance, but a bit of a nuisance when children are ill, or twenty of them are using paint or glue at the same time.

How easily can you add two classrooms to a circular school? The circle is a pretty complete shape. Even a polygonal plan can present some problems in this regard.

How can you demonstrate a tape recorder to a small group of children in an open classroom with another group talking behind an adjacent movable storage unit?

Are stairs in again? In an era of high land costs it is still easier to make small additions to single storey buildings.

How successful is team teaching really? People are still people and some teachers are not too keen on working in front of one another, not all parents like to instruct their children in front of their neighbours.

It may well be argued that it is as difficult to provide a standard planning solution to a school as it is to provide a standard house plan. The architect must try to assess all the needs of a particular client relatively, and be able to sense variations of similar requirements.

From the research to the detailed design, given the requirements the architect will formulate ideas and evolve an initial concept sufficient for early discussion with his consultants. The consultants are still nominally three engineers, structural, mechanical and electrical, together with perhaps a landscape architect, interior designer and the developing specialist, the quantity surveyor or cost control advisor.

Preliminary structural considerations will include the study of soil and rock conditions, the use of building elements such as movable partitions which may lead to high point loads. If, for example, we use movable partitions this means we will not have any fixed internal walls to use for holding up upper floors or the roof. So we will need some bigger beams or special structure to span longer distances. This will cost more money, is it justifiable? Will the movable partitions really be moved by the user? How easy should it be to move the partitions? Should the teacher, the janitor, or a construction crew be able to move them? I have heard of a school where movable partitions have not been moved since they were installed four years ago. In some cases the requirement of movable partitions may vanish with the transfer of a principal.

Movable partitions affect the complexity of mechanical and electrical layout with regard to heating, ventilating and plumbing locations, as well as the position of light fixtures, switches, controls, signal and communication systems, and audio-visual power points. Hand in hand with the movable partition comes the windowless area and its treatment.

Should we have windowless rooms at all? Is it practical to cut people off for prolonged periods from visual contact with the outside world of which they are a part? It is certainly cheaper to build external walls without windows. There is less heat loss in the winter and heat gain in the summer. The problem of glare and darkening rooms for films is eliminated. However additional factors appear, we must have improved ventilation, and some form of cooling system becomes essential. It may also be noted that an electrical power failure renders such a building useless at any time of the entire year, and the number of potential exits in case of a fire emergency is greatly reduced.

Incidentally, whilst visiting schools in Syracuse, N.Y., where windowless classrooms were tried some years ago, I was told that a very small number of children were adversely affected by this form of enclosure, so much so that it was made mandatory that some form of window be provided in public school classrooms.

Such features as this must be assessed and their relative merits and costs approximated and a feedback of information provided to the owner in order to further determine planning direction. Higher costs may be acceptable to an owner convinced of the desirability of a particular feature. Speed of construction may be an offsetting feature in considering higher construction costs.

Time is a most critical planning element and must be co-ordinated particularly when considering such items as the availability of materials, local building programmes, current building techniques when the familiar may be dealt with much faster than the new innovation.

Having dealt with as many requirements as are apparent at this stage, the architect must present a preliminary plan and estimate of cost to the School Board. From this presentation a Board decision may be obtained and approval to proceed with final plans and specifications given to the architect.

Final drawing production presents the normal problems of co-ordination between the architect and his consultants, decisions on the type of structure and heating system, down to the type of paper towel holder. This will include heating duct sizes co-ordinating with beam sizes to give adequate clearances without hanging below the ceiling, ensuring that high level cupboard doors don't hit suspended light fixtures, laying out systems so that they may be easily extended and maintained, and selecting equipment that may be serviced quickly with parts from local sources.

Mention was just made of the critical factor of time. This is a problem which may be helped by staggering building programmes. Not only would this be of help to architects, but to contractors as well and in fact to the whole industry. Most importantly it would help the school building program. We realise it is not easy to predict enrolments, and provincial, county and municipal budget dates are fairly inflexible and subject to many pressures, but something of this nature will have to be done if we are ever to dispense with the annual September school sweepstakes. The concentration of building programes beginning in Janurary for occupancy by the following September, inevitably lead to higher prices, erosion of quality and a strain on suppliers. This is regularly manifested on the site in the form of fictitious delivery dates, leading to delayed completion and a temporary severe shortage of accommodation. In addition we develop irritated teachers, irate parents, persecuted school board members, hounded architects, and frustrated contractors. Nevertheless the real loser is still the taxpayer and particularly the school child who may be disturbed two or three times in his public school career by crowded and inferior accommodation and even a hostile environment in the case of pupils of a temporary "host" school.

Perhaps I hear a murmur "Why don't architects get their plans out faster". Even if drawing production time was halved it would not relieve the concentrated requirement. Perhaps manufacturers should by now be better prepared for this pressure which has become the annual norm. It is invariably the supply of parts which is given as reason for delay of the whole.

It is invariably the supply of parts which is given as reason for delay of the whole. Erection and on site work never seems to be a problem according to the general contractor, that is until there are a few strikes to contend with. It is most infuriating for the architect to see the job at a standstill waiting for materials, afterall the effort that has gone into preparing plans quickly and agitating for approvals.

With the completion of working drawings, specification and estimates the architect makes a presentation to the school board for final approval and assists in their processing through the provincial Departments. Once again the speed of approval is significantly affected by the building program, for approving authorities are invariably loaded with projects at the same critical period each year.

After receiving approval the drawings are ready for tender, the moment of truth is at hand, we will soon know for exactly how much someone is prepared to build the school and how long he thinks it will take him. Great hopes are embodied in the tender drawings. They represent the efforts of a large number of people from many walks of life and this combined effort is for one purpose, to provide good and economical schools for our children.

It is the role of the architect to co-ordinate this effort into a plan and to produce drawings which contain accurate, clear and complete information to fulfill the intentions of all those who have participated in the project.

We now move into the area of planning and co-ordinating the actual building operation, which involves another and most vital member of the team, without whom not much would be done. I refer of course to the building contractor.

Close liason and interchange of information must be developed quickly between the architects' team and the contractor. The sequence of work must be carefully planned and all necessary shop drawings swiftly prepared and processed, if the completion date is to be met.

PLANNING COORDINATION FOR SCHOOL CONSTRUCTION by Mr. L.S. Ginsler

One of the most serious problems affecting the planning and coordination of any project is the difficulty in interpreting correctly the requirements of the owners, architect and all the consultants with regard to the required building services, construction methods and environmental standards. This becomes increasingly more difficult as the mechanical and electrical services become more sophisticated each day and where the architect insists on separating the consultants from direct contact with the owner's staff in the early design stages. Frequently, the only personal contact arises when operating difficulties occur or omissions become apparent which require direct confrontation and explanation.

It is indicated that a closer direct working relationship with the client can establish a rapport and liaison which can frequently prevent misunderstandings which arise as the result of information being passed on second and third hand.

Even where the personnel involved have worked with each other before and all are familiar with the procedures of each of the organizations, the many decisions frequently relayed verbally and through various staff members can be misunderstood and assumptions based on previous projects found to be incorrect.

In some school projects and for that matter most Government projects, a brief is frequently prepared outlining the program and purporting to clarify the requirements. Unfortunately, in many instances these tomes contain information gathered by staff unfamiliar with construction in general and building services in particular and considerable care and judgment must be exercised in the interpretation of the presentations. In one instance it was indicated in the brief that a temperature control of $75^{o}F \pm 10^{o}$ was required and this was understood initially as a requirement to be able to adjust room conditions by $20^{o}F$. In fact, it turned out instead to be a directive by a scientist not having a full appreciation of normal environmental standards. He was simply indicating what in his mind was an allowable tolerance from the $75^{o}F$ norm. The final solution was the usual $75^{o}F$ standard with a tolerance of $\pm 1\frac{1}{2}^{o}F$.

Many of the universities and lower school boards define now the minimum construction standards in written form and these are issued with each project to the design team. This can be of very substantial help in the early concept stages. Unfortunately, these directives are often authorized by maintenance staff whose sole interests lie in reduced operating costs and who have little, if any, responsibility for initial capital costs. Without careful and constant supervision this can result in the application of standards and the use of products out of keeping with the rest of the project and the budget and create "empire" building.

It is suggested, therefore, as a part of the team coordination that each of the principals involved prepare formats listing direct questions, assumptions and understandings with respect to their aspect of the work. In the mechanical and electrical field, for instance, I would normally prepare such a questionnaire in three parts; one dealing with such general items as glazing (double or single), insulation (material and thickness), budget, completion dates, etc. and two other sections dealing with specific mechanical and electrical questions. As a matter of convenience I prepare these in such a form that the answers can be indicated below each question and then copies can be run off for each of the people involved. This enables decisions to be made known readily to everyone concerned and in writing.

It is necessary in planning each school building and in considering the mechanical and electrical designs to utilize as much as possible local materials and products to minimize costs and deliveries as well as replacement problems. In addition, it is always vital to give proper due to the experience of the existing maintenance staff and local outside service organizations when selecting and developing the mechanical and electrical designs. I would suggest that for example, in remote communities lacking local control service representatives.

to limit the use of sophisticated central systems and possibly to apply as much as possible pre-packaged units which are pre-wired and pre-tested. In addition, it is suggested that the institution of teaching programs for the staff where new concepts in design are being applied is in order.

In conclusion, it can be reaffirmed that planned coordination in school design can only be and will only be accomplished when the team concept encompasses representatives not only of the professionals such as the architects and engineers, but also the client who eventually is assigned the responsibility for establishing the requirements (and authorizing paying the bills) and the builder who actually arranges for the construction to take place.

THE IMPORTANCE OF COST CONTROL ON SCHOOL DESIGN by F.W. Woodcock

The subject of this panel discussion is defined as: THE IMPORTANCE OF COST CONTROL ON SCHOOL DESIGN. This title is acceptable in its present context, but I would like to suggest to all of you that it could more appropriately be: THE IMPORTANCE OF COST PLANNING AND CONTROL.

Cost Control appears to mean different things to different people, but reduced to its most meaningful definition should, I feel, be taken as the system of control of all costs that will be incurred in the process of implementing and bringing to realization any design concept for a school, or in fact, any building.

Before turning to a detailed review of the cost control process, it is important to establish the fact that without cost control, the practical and acceptable equation of building design to considerations of function, utility and general acceptability cannot be achieved for the reason that these basic criteria for any building can only be ruled as acceptable or fulfilling program requirements if they do in fact fall within stipulated budget limitations set for the project.

Therefore, recognizing that it is becoming the practice for any owner/authority having a requirement for a building, and in this instance we will consider educational buildings, to stipulate their need in the terms of a certain number of square feet of teaching space in one or another of a number of classifications such as academic, general scientific, technological, laboratory, commercial, or physical education etc. Recognizing that each different type of educational space requirement can only be fulfilled by the creation of space suitable to that requirement, the preliminary program of requirements for any educational building becomes a prerequisite for the formulation of a cost plan which can be applied to that building need.

In the foregoing, we have introduced a new term which is "Cost Plan". It must be accepted that without a Cost Plan there can be no effective Cost Control.

By the term of "Cost Plan" we understand there being created a schedule of allowances related to the basic plan for a building which establishes for each element of such building a unit of gross allowable cost per square foot of floor area for the erection of that building. Therefore, in an orderly progression of events, we visualize firstly that the authority requirement is defined in the terms of a written program of requirements identifying the number of square feet of educational building space required to fulfill each teaching function. This program is then transcribed into a building plan indicating the orderly and thoughtful layout of a building which will fulfill all space requirements of the stated program.

When this preliminary planning work is completed, then it is possible to establish a detailed Cost Plan which will govern all design, detailing and specifications for that building. Such cost plan will take into account all factors of cost which arise from the location of the building, availability of contractor organizations in the vicinity of the building, any peculiarities or difficulties related to the site of the building, special academic or integrated requirements which are applicable to the building in order to make if fit the broader concept of educational policy and any other factor which circumstances make applicable.

On the basis of the foregoing procedure a Cost Plan is established for each individual educational building, such Cost Plan taking into account all factors peculiar to any one individual building can only be accepted and used to a limited extent as a basis for the establishment of a Cost Plan for other educational buildings having similar requirements but located in different areas. In most cases a Cost Plan must be professionally drawn up to suit each separate building having regard for factors peculiar to and requirements for and applicable only to that building.

Despite the particularity of the above definitions which relate to the establishment of a Cost Plan, there is a valid basis of comparison of Cost Plans for one building to the formulation of Cost Plans for other buildings intended to have comparable functions. It must however be appreciated that the adaption or utilization of one Cost Plan for one building to the Cost Plan for a similar building can only be undertaken by an individual who is professionally qualified to recognize the extent of an acceptable similarity between buildings and the extent to which some provision must be made for divergence of circumstances or requirements between buildings.

COST CONTROL: You will perhaps feel that my previous comments have taken a long and devious route towards the subject of Cost Control, which is the subject of this discussion, however, I would like to reaffirm to my previous statement, which was that there can be no Cost Control without a Cost Plan, just as there can be no law enforcement without there first being a law.

Therefore, having established a Cost Plan for an educational building in the form of an identification by statement of quantity requirements for materials and labour for each element of the building under consideration, therefore, we will in our Cost Plan have identified the approximate quantities of material and labour required of every sub-trade, which will be priced in consultation with trade contractors; all feasible alternatives in the selection of materials and fabrication and erection techniques will be examined and final Cost Plan allowances thus determined.

The above mentioned statements of quantities and costs for materials and labour will be tabulated and converted to a total unit of cost per square foot of gross floor area for each type of educational space required to be contained within the building under consideration.

The fundamental basis of cost control is then equated to a summarization of the costs which are allowable on a unitized basis for each element of the total building project. The control aspect becomes therefore a procedure by which the process of design finalization through to completion of construction can be governed in order to ensure that such detailing, specifying, construction and finishing is performed in such a way and using such materials as will fall within the Cost Plan stipulations.

COST CONTROL PROCEDURES: My talk today would be meaningless and fruitless unless it were to go beyond the present stage of stating why a Cost Control program is evolved and what factors must be considered in its formulation. The next question therefore must be, having recognized the need for

Cost Control, how is an architect to accomplish the establishment of a Cost Plan and subsequent Cost Control of the design and construction process? The answer is obviously the retention of a specialist in this field.

Despite the apparent pragmatism of my previous statement, I recognize the fact that some architects and engineers may have within their organization individuals who are qualified to prepare realistic and meaningful Cost Plans and also instigate and implement efficient Cost Control procedures. Nevertheless, such organizations are few and, therefore, my following comments must be taken as being primarily applicable to those organizations who do not have such capacity within their existing organization.

In cases where it is necessary to design an educational building within the limits of a stipulated budget then there are a limited number of courses of actions by the adoption of which it can be assured that budgets will be met and observed through the program of the work of designing, detailing and constructing the building. I would like first to deal with the situation from the point of view of the educational authority, as follows:-

1. At the time a building requirement is determined, the educational authority has the power to stipulate that their architect shall be subject to the control and direction of a nominated project management organization. Such organization will normally possess the requisite personnel to compile realistic cost plans and apply Cost Control measures to the complete design, detailing and construction functions without in any way restricting the architect's freedom in the field of conceptual design and aesthetic consideration for the building.

2. The educational authority can at the time of appointing an architect for any project stipulate that such architect shall be required to retain the services of a suitably qualified quantity surveyor for the preparation of Cost Plans and the application of Cost Control procedures.

It is my submission that by far the most efficient of the above mentioned alternatives open to an educational authority is to appoint a project management consultant to control and direct the entire design, detailing, specifying and construction process, as by the adoption of this alternative, there is designated one authority having an all embracing and comprehensive control of all organizations contributing to the total project.

IMPORTANCE OF COST CONTROL ON SCHOOL DESIGN by Mr. M.A. MacLeod

It is evident to all that the demand for funds by each level of government has reached an alarming peak. Like the faithful water well being used to it's capacity, the source of these funds has to have time to replenish the supply. The people of Ontario are the source of funds for our discussion here although citizens elsewhere have similar problems.

If funds are to be restricted, then why not make better use of the funds we have? Why didn't we do it a long time ago?

One of the major advantages of larger units of administration for school systems recently established under Bill 44 is the opportunity to look objectively at the educational needs of a large geographic area. It eliminates to a large degree the former competition of small boards setting up small schools where fancy dictated. The county system has built in safeguards by requiring the employment of qualified personnel who have the experience and knowledge necessary to assess the needs and recommend the accommodation required. This is where cost control begins.

Our topic has been set to discuss the "Importance of Cost Control on School Design". I will talk for a few minutes from the viewpoint of a School Business Administrator.

Cost control, to be effective, should be a factor in the minds of planners right from the time the need for a school develops. Each school system has an educational philosophy and this philosophy should be reviewed at the time of site acquisition. There have been many articles written to assist boards in making a good choice of sites. The initial cost of a particular site in a poor location may be lower than the cost of one situated better educationally, but by the time you have added the cost of fill, grading, oversize foundations and transportation to the less expensive site, the higher cost of the better site may be justified.

The location of your site and the visibility of the school to the community is important. This may not reduce the cost but when the community is helping to pay for it, citizens like to be able to see and point out a fine building to their friends.

Once the site has been acquired, the competition to make the best use of dollars should begin, not only for the building but for the yearly maintenance as well. Too often, fundamental items such as ground levels, drainage areas and plans for easy snow removal have been overlooked.

Educators are looking for schools which are flexible enough to meet the changing needs of society. Flexibility in school design should mean:

- expansibility for exterior changes
- versatility for multi-functions
- convertibility for interior changes.

Architects are being asked to build these schools and keep the cost within restricted limits. Various factors have been established. Metro Toronto uses $20 per square foot excluding fees and contingencies for site preparation. Others being in a cubic foot cost of $1.00 and others check to see that the proportion of the mechanical and electrical cost to the total job is in the range of 25-32%. This establishes a strict competition to produce buildings within these limits. Much credit must be given to the Architectural profession for the success achieved by the clever use of materials to keep building costs to where they are in spite of the rapid increase in the cost of labour.

The cost of education has escalated rapidly in the last twenty years and there doesn't appear to be much chance of any let up. New buildings are still required.

The Ontario citizen is complaining because the bill for education is increasing and he is demanding that something be done about it. Something has to be done to stem the tide. The importance of Cost Control on School design must be acknowledged and enforced.

The Department of Education has been aware of the increasing cost and as a result has redesigned it's Capital Aid program. Some very effective controls have been built into this

program. It is quite likely that Mr. Spry will elaborate on these in more detail.

It is evident that school boards are going to be required to take a critical look at their own programs.

In the more rural area, planners are going to judge the closing of the two and three room schools and the development of the central school concept.

This may involve a complex with separate quarters for Kindergarten to 6, 7 to 8 and 9 to 13. It is in this area of planning that the school system can assist in controlling the cost. By setting up a master program for Secondary Schools, a board will be able to design many special vocational courses without extra space requirements. This was not possible before in smaller units because of the high operating cost of running these special classes with low class enrolment. Now, one area will be able to specialize in such subjects as data processing, refrigeration or printing while another would develop electronics and auto shops and each would operate with full classes. Maximum use of existing space will help to slow the need for new accommodation.

Boards should plan their Capital Building program for at least five years in advance and for reasons other than the Ontario Municipal Board requirements. For example they should try to pace the calling of tenders to a lull in commercial and industrial developments to obtain a better construction price.

Getting back to the design, serious consideration should be given to the use of steel and pre-formed concrete. If you have not seen the new buildings at Durham College, it would be worth your while to investigate them. It is understood that these are being built for $10.00 a square foot.

Who knows, we may be able to extablish an effective cost control and new design concepts at the same time.

IMPORTANCE OF COST CONTROL ON SCHOOL DESIGN by Mr. W.E. Barnett

1. GENERAL REMARKS

We must first determine or define cost. In my opinion the cost of a school is not confined to the capital expenditure for construction, if one is to compare school building costs. In my opinion cost of a school building for comparative purposes should be both the capital cost at the time of construction plus the operating and maintenance cost over a reasonable period of time, which should be a period not less than the debenture period.

No matter how much effort is expended by the architect on practical cost saving, there are a number of governing factors that vary from time to time, generally reflecting in an increase rather than a decrease in cost, and these are factors over which the architect may have limited control. For example, about twenty three contracts in the Metropolitan Toronto construction industry are subject to renewal this spring, because by coincidence old contracts for various trades for various numbers of years terminate, unfortunately, at about one time. The current increases in wages alone being sought vary from 40% to 90% and negotiations are taking place in the knowledge that just recently a 73-day strike of bricklayers in Ohio - just across our international water boundary - resulted in a two-year contract for the bricklayers in that area to receive $9.75 an hour, wages only, which is about twice the Metro figure, and the astonishing figure of $19.50 an hour for overtime, and other trades seeking, and in some cases getting 100% wage increases.

Schools are not alone in their concern with rising construction costs. It is a national problem. The construction industry is currently employing "on site" 133,000 wage earners at

an average current wage of $135.00 a week: a payroll of $18,000,000 a week. The current situation is that the cost of labour is approaching about 60% of the cost of construction, and material, the remaining 40% which is about the reciprocal of the position of ten to twenty years ago.

2. WHERE IS THE INDUSTRY HEADED

One could talk at great length on this subject, but briefly, the general contractors are rapidly becoming brokers maintaining only administrative staff at headquarters, and key personnel, superintendent, carpentry foreman, etc. on their permanent payroll, all other labour being hired from hour to hour, day to day, from union sources as the need arises.

There is little reason to select a general contractor, and in most cases a sub-contractor, because of the capability of his "on the site" staff since the contractor at any level now has limited control over the "on site" workmen that he will employ.

As a result of all of the above general remarks, to which many more could be added, there is a trend towards industrialization of the construction industry, with large component parts of a building being made under the controlled climate conditions of manufacturing plants and delivered to the site to be hooked together with a minimum of on-site labour.

The S.E.F. program in Toronto, the C.L.A.S.P. system in England, both of which you are to hear more of later in the program, and the many systems in the United States are simply the industrialization of the construction industry to one extent or another. This does not mean that every community has to embark on a S.E.F. or similar program. The Metropolitan Toronto experience has emphatically indicated to industry the benefits of development of system or component part construction, and I will be very surprised if industry does not pick up the torch from there.

3. RESULT

As a result of the above, which I again emphasize are only a few highlights contributing to the background in the change in the industry applicable to other forms of construction as well as schools, there is the potential of some favourable as well as unfavourable results. For instance, standardization of large components of construction units will limit the opportunities to exploit site topography and other possible natural resources of the site. The opportunity to add a foot here or there, or make modest changes in the outline of the building will be lost. Large changes may be possible, providing they are in accord with the large pre-manufactured units of construction. Therefore the program of needs will have to be developed to a precise and final conclusion, and once construction starts additional thoughts will have to be saved for the next building program.

On the credit side of the ledger, there could be a great deal more flexibility in the internal layout of the building because removable and portable types of area segregations will be used, permitting the building interior to change with the changing teaching techniques and aids with little if any cost. This will all result, of course, in a controlled and similar environment throughout most, if not all of the premises. This is another subject on which one could spend the entire allotted time discussing the potential advantages and disadvantages.

To control cost in school construction today under all of the above background circumstances, therefore, the client and architect must work even more closely together, particularly in the initial stages.

4. HOW CAN THE CLIENT HELP

It will be even more important for the client to benefit from the architect's advice in the selection of a site.

There will be limitations on the compatibility of pre-manufactured units to unusual site conditions. I have always believed that the architect should assist the board in the selection of a site. I can always recall a board visiting a site for a school with me and wondering at my dismay when I expressed some concern over the healthy growth of bullrushes over the area.

It will be necessary for the client to organize his academic requirements not only in respect to space, but also in

respect to philosophy, the open or soft plan versus the hard or inflexibile layout. It will also be necessary for the architect to have a knowledge of the client's approach to teaching techniques and the type and extent of teaching aids to be employed, and to be catered for by the physical plan.

An architect's fee is a constant factor, being a percentage of the cost of construction, and it is in the client's interest, therefore, to provide a reasonable production time for the architect, permitting him for that same fee to develop to a finer degree with the client a building to better satisfy the function for which it is being constructed. Though an architect cannot guess the trends of the market any better than the client can guestimate the fluctuations of the stock market, it is the responsibility of the architect, within reason, to build within the confines of the client's budget. It is the responsibility of the client to present the architect clearly and concisely with the budget, and if there is any disagreement as to the ability to provide the needed accommodations for the budget, it is the architect's responsibility in the initial and development stage to so advise the client in order that adjustments can be made without a great loss of time and effort on everyone's part.

At this early stage it is not unusual to talk in terms of square foot costs. This can be hazardous, and it is essential that each party know precisely what is to be included in the costs. The client should advise the architect on his policy in respect to stand-by equipment and sophistication of operation. This varies greatly from board to board, and what one board considers adequate another board would consider very inadequate, and this is one of the contributing factors that makes it difficult to compare one school with another on the basis of square foot costs unless one knows precisely what the square foot costs include or do not include.

The client can help the architect and himself by advising of any pet requirements and standardization of equipment that may be desirable in a school system, particularly in respect to servicing and repairs. It is also most important that the client advise the architect after proper consideration of the expansion potential of the building to be built. So often a board will say that a building will do for the next fifteen years, and the architect finds himself back on the site in less than five years. This costs the client a considerable amount of money, as expansion facilities should have been built in at the time of initial construction at a lesser cost, avoiding the tearing down of walls, ceilings, floors, etc. in order to provide services and unforeseen interior alterations.

Again, limitations prevent a continuation of this subject, but I am sure that you get the general trend and can add many more relative items yourself.

5. HOW CAN THE ARCHITECT HELP

It is important that the architect have a thorough knowledge of the "School Business Procedures Manual" to take maximum advantage of the Provincial grant that can be obtained for the academic requirements of the building project. There are many ways in which care in this can work to the benefit of the community.

It is important that the architect be up to date on construction cost trends and forecasts, not only to keep the client advised of realistic estimated costs, but to take advantage of seasonal and other construction fluctuations in the market. It is important that a project be out to tender in a competitive market. If three or more tenders are being called at the same time, the competitive situation and the interest and time of the contractor that can be afforded to the tender can vary considerably. A well considered estimate by a contractor is usually a better estimate.

It is important for the architect to be knowledgeable on the degree of sophistication in both the design and operation of the building. Usually such sophistication costs a considerable amount of money. We have one school where the principal, by pressing a button on his office desk, can read the temperature of every room in the school. This is but one example of many operational facets that

can be built into the school, but often at considerable cost.

The architect should be thoroughly familiar with the building by-laws of the local community in which the project is being constructed. A thorough knowledge of the requirements of the Fire Marshal's Office of the Province; the Health Department of the Province, and other bodies with jurisdiction over the construction of the project can work to the client's advantage. It is important to work with, and not against Government departments. Government departments are anxious to assist in developing economic solutions to building problems and, of course, still complying with the requirements.

It is important to design to suit the need in scale with the use and occupancy of the building or a room in the building. For instance, it is not unusual in an elementary school to find the room with the greatest ceiling height to be the kindergarten, which accommodates the smallest people in the building.

It is important that the architect provide a cost estimate on a square foot basis at the schematic stage of the building development, with more accurate estimates being provided at the preliminary stage of the development, and an estimate based on quantity take-offs during the working drawing and specification stage, at which time the client should be advised of the cost picture, and if the client has been requesting additional space or making changes that are adding to the cost, the client should be advised at the time he makes such requests during the development of the working drawings and specifications.

The client should be informed of the services of the quantity surveyor, particularly where budgets are unusually restrictive or where some unusual local conditions or unusual nature of the building proposed may demand unusual caution in cost estimating. Either the architect or the client should provide a reasonable and practical contingency allowance, and each should be knowledgeable that proper provision has been made for unforeseen site, building or climatic conditions.

It is important that the client be kept informed monthly during the construction program on adjusted contract amounts, with written change orders issued monthly. It is not good business for either the architect or the client to complete the construction and then find a considerable list of unexpected additional costs. To effectively do this, the architect has to impress on the general contractor the need for monthly accounting, and the contractor in turn has to let each sub-trade know that additional costs will not be entertained for extra work after the work has been completed.

It is important that the client be informed on the materials proposed to be used in the construction, with a brief explanation as to why particular materials are selected and their particular effect on budget. It is important that in a project of modest budget the dollars be spent where the need is greatest.

One of the most important responsibilities of the architect to the client is to inform the client precisely as to what basic services are provided by the architect in the fee he is charging. The client will then know whether additional services of consultants are required, and to what extent.

There are no doubt additions that can be made to this list, but if consideration is given to all of the above, cost control and cost savings can be provided for a building project, and the chances of a happy relationship between contractor, client and architect can be experienced at the completion of the project.

6. CONCLUSION

The architect has a right to expect a client to have a reasonable budget, and if the budget does not seem reasonable to the architect the time to make this known is at the beginning of the project and not after tenders have been called.

The Client has a right to expect the architect to live within an agreed budget, subject, of course, to moderate

and reasonable tolerance. Good design does not command high costs. Reasonable cost, however, demands good design.

If a client has a good client-architect team working for him - keep it: it will work even better with repeat use and familiarity.

HARD AND SOFT SCHOOLS by Mr. R.G. Rist

Today's educators are constantly bombarded by an increasing number of pressures created by other professional educators, by a host of anxious amateurs, and by ever alert opportunists who realize education is now big business. The educational field is filled with idealists and pragmatists, traditionalists and innovators, opportunists and martyrs; all have a part in shaping education.

We are being inundated by a multiplicity of educational trends and innovations which become popular, and lose popularity, as often as the fair sex's migratory hem line. Many of the trends and innovations of today are resurrected trends and innovations that some of us have experienced before. It is increasingly difficult not to believe in reincarnation; certainly you often feel that you have been here sometime before.

Some of the more clearly identifiable trends that characterize education in North America and Europe are:

Uniformity of curriculum to individuality of curriculum,
Required set of courses to more electives,
A time unit of one year to semestering,
A graded to a non-graded approach,
Discrete disciplines to subject clusters,
A stress on content to a stress on processes,
A sequential approach to discrete units of work,
cognitive to the affective
Emphasis on past to an emphasis of the future
Adult-determined curriculum to a student-determined curriculum.

If you superimpose a variety of modes of learning, a bewildering array of educational hardware, and a growth-constrictive budget, on the recognized trends, then it is obvious that all of us who are involved in education, either intimately or peripherally, must become masters of compromise. Using Anthony Barton's Hard-Soft School concept, I would say that

each of us needs a hard-soft approach to the whole business of education.

We will always have educators assuming positions of extremes which will be reflected in a completely hard, or completely soft, concept of education, It takes a considerable amount of intestinal fortitude to maintain a position that incorporates the best of traditional approaches to education, melded with carefully selected innovative trends. It is so easy to move from one caricature of learning, typified by all that denotes "hardness", to another caricature embodying "softness". In the Province of Ontario, at the moment, we have schools that range from one extreme to another. This, I maintain, is a very healthy sign and it is in this kind of environment that authentic innovations and trends of substance begin. Individualization of approaches to learning by school systems or individual schools, is itself a necessary part of a hard-soft approach. It is no more viable to dictate to a school or a system, a philosophy of education, than it is to dictate to any child what he must learn. Educators must always have the privilege of deciding where on the hard-soft scale they wish to pattern the rationale of that part of the educational system in their care.

When educators are criticized for indecision in establishing a clear-cut direction, and in developing a curriculum to reflect that direction, I believe that this is a healthy sign also. It is too easy to accept all that is recognized as new and innovative with total, or at least partial disregard of aims and objectives. The school or system that embraces all that is new in its curriculum assumes a position just as untenable as that in which nothing new is ever considered. There are situations developing in North America where the school develops an admirable program incorporating subject promotion, individualized learning, student-selected curricula, but at the same time, incorporates a high degree of permissive behaviour on the part of staff and students. At the risk of sounding heretical, I fail to see how extremes of permissiveness with no rules and "no holds barred" has to be a necessary adjunct of a progressive curriculum. In a school with no rules, even the "Golden Rule" goes out the window. A school of this type is moving to the extremely "soft" stage, to become a flaccid, amorphous mass with little purpose except to please all, at all times.

I see no time in the future during which anyone concerned with education, whether it is the designer of the school, the supplier of hardware, or the provider of learning materials, can make an assessment of a trend, "gear-up" for it, and then sit back complacently while the blue-print goes on servicing for many years. It is unquestionably cheaper to make ten thousand copies of one original Paris dress creation, than it is to make ten thousand originals.

It is most obvious that any design whether for a building, a book, or a curriculum, when repeated many times, becomes economical in terms of money, energy and ulcers. However, if I may stretch the dress analogy a step further, any lady is skilled at taking the simple basic black dress and making it suit any occasion.

I think we must become more skilled in recognizing the basic garment in education and become less prone to losing sight of it as we pursue the development of the decorative devices of the garment.

The support forces for the educator have always tried to be completely aware of the philosophy, aims and objectives, of each school system before providing the supportive services, but it is imperative today that the supportive forces reflect the same flexibility of approach that is charcteristic of most sytems today. Supportive services have an awesome effect on educational trends. So many curriculum builders spend millions of dollars to produce highly sophisticated-package deal which the educator is expected to purchase, and implement in its entirety; publishers spend small fortunes providing learning materials which of economic necessity are expected to last several years. Designers of school buildings develop designs to reflect trends and then do such a good job that the design tends to maintain the trend, or shape it further.

The most clearly identifiable trend in education that is visibly evident in school-design, is the no-wall trend. The design is intended to facilitate the open-concept learning situation with a variety of student and teacher combinations. But there are not many schools of this design that have developed the learning situation as intended. The mental walls still exist, aided and abetted by the well-placed set of shelves, planters and cupboards. Should we pursue, for many years to come, a trend that has developed

excellent school designs and relatively weak school programs, or should we await until more teachers are skilled in the new situation, or for that matter, want to teach in such a situation? Should we wait until some sort of assessment tells us that the approach is so good that we should pursue it in greater numbers?

I feel that the no wall trend should resolve itself into a direction better suited for the individuality of students, teachers, and communities. Just as the fishbowl existence of apartment dwellers is found to be considerably wanting in certain social aspect, I suspect that countless little bodies scattered over acres of broadloom has certain social shortcomings. I wonder if the concept of a school of fish, or a school of children started first? Even fish like to be alone sometimes. Open spaces and intimate closed-in areas are surely necessary for all human beings at all age levels, and could become the "basic black dress of school design".

Each of us must become aware that most educators are not going to move philosophically from a hard position in education to a soft one, but instead they are going to develop positions anywhere along the spectrum. All supportive services must realize this may be disturbing for the programming of such services for any length of time.

Within the allowable limits of financial necessity and professional integrity, supportive services must accept the fact that educators will be constantly seeking to provide the best possible education for every child in the province. The only thing that is becoming the same or equal in education, in any sense of the word, is the equal opportunity for every child to get the best possible education.

HARD-SOFT SCHOOLS - WHY FLEXIBILITY? by Mr. J.K. Crossley

I'm going to base my few remarks this afternoon on one dimension of the school only - I've seen so many schools, in so many places, that the secondary importance of the building is something I take for granted now, as I see successful programs for students in quite unprepossessing environments, and beautiful testimonials to designer skills housing activities that can barely be termed educational.

But having said that, I've really criticized my own kind in education, those who plan programs, who prepare teachers, who think about the nature and purposes of the educational process in a school. We've rarely made clear statements when asked to do so by the designers of schools - we often speak with many tongues - the generalist, the specialist, the child-centred, the academic, the technician, the elementary, the secondary, and so - a babel of opinion, each convinced of its own correctness.

I want to try and tie together as many of the loose ends as I can, to look at the school in a more basic dimension, and in that dimension, we might find some clues of use to designers of environments for learning. I'm going to turn to a fairly old idea and to the work of Joseph C. Grannis for my basic theme.

Professor Grannis is head of the Divison of Instruction at Teachers" College, Columbia University. He has written a paper called "The School as a Model of Society", and it is basically his point of view that I am using here, although I am adding my own basis, of course.

Essentially, Grannis reminds us that a school represents, to its students, a model of society. In the patterns of behaviour of students and teachers, "in the authority and decision-making structure of the organization, in the ways that people talk with one another, learn and work and play together" - in these ways, and more, a school teaches students about society.

He says, and I agree most emphatically, that it is the structure of the school in these dimensions - of organization, of status groups, of implicit behaviour rather than overt behaviour of "the little things" so accurately gauged by children, the tone of voice the loudness of the bell, the remoteness of the principal - it is in these dimensions that students learn about society.

And then Grannis tells us of the models that we have unconsciously been using for our schools - for rather than the educator formulating a societal model for education, and incidently, for the buildings to house that model of society, the educator has adopted instead the patterns of the most pervasive and basic institution in society.

We are just now coming out to the stage of using the factory as our model for the institution called "the school". We are moving away from the use of identical grading standards and from the use of "assign and recite" as the standard lesson. We are questioning the value of failure, the discarding of those units that don't meet the standard, in factory terms. We are questioning the value of repetition of a dull and endless nature.

Now, in special education, we are even questioning the removal from the production line of individuals who fail to meet the laid-down standards. We now urge the integration of handicapped kids in non-graded classes, especially.

Competition, of course, is encouraged in the factory school. Rather than quality of work or individual initiative though, it is competition in quantity and speed that is rewarded - provided the line is not upset by someone doing next year's work.

Authority, often paternalistic, sometimes worse, characterizes the factory school. The directives of superiors must be listened to. Time is used as an important element of control - regulation of time is essential to keep production moving. So too, is regulation of space - students must "stay-put" in their stations, or disruption might occur.

As one visitor said when he saw a suburban egg-crate school, the typical factory school can be viewed as a lower-class joke on the middle class.

Then Grannis moves on, and suggests to us that we are now busily adapting our schools again. My references, as do his, apply to both elementary and secondary levels. We are adapting to a new model, and this time, it's the corporation from which we are getting our patterns.

There is now to be co-operation planning by teachers. More rationalizing of actions takes place - it is called Program Planning and Budgeting Systems in industry. PPBS Objectives are stated and flow charts and statements of goals are prepared to govern action. In schools, we call it team teaching.

More specialized materials of instruction are now employed in the corporation school - special aids are often developed by teachers themselves. More specialized equipment is used: projectors, computers, tape recorders, head sets - the new tools of the corporation.

There is quite a hierarchy in the corporation school - of principal, team leaders, department heads, teachers, teacher aides, and finally students - with various degrees of authority distributed up and down the pecking order.

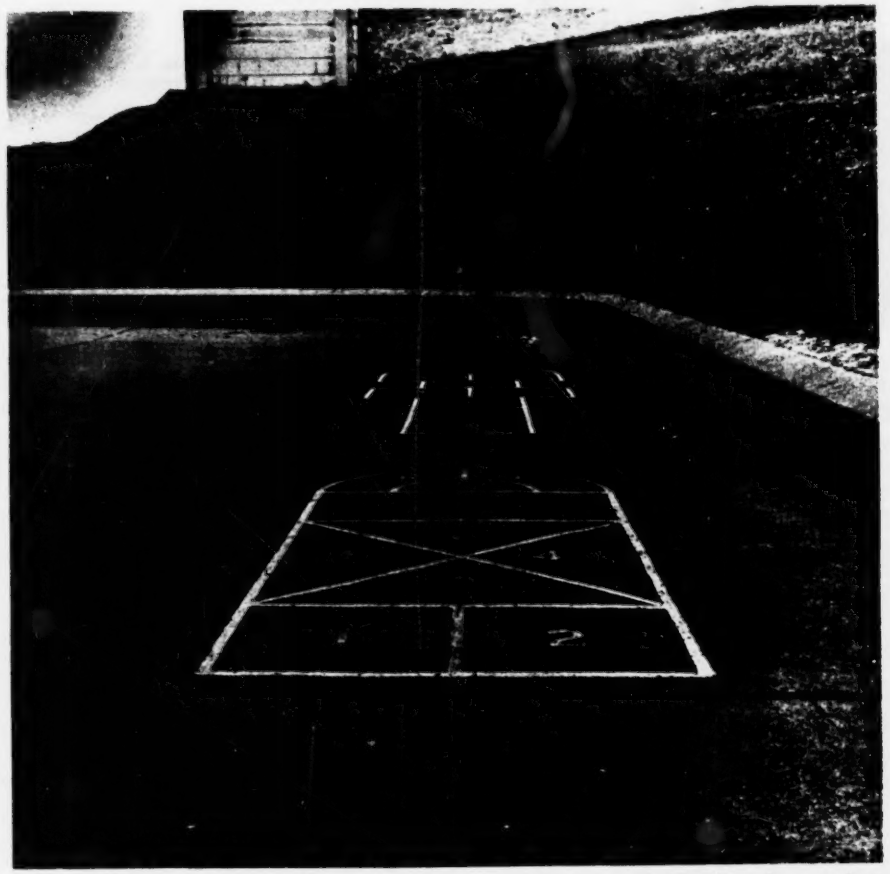
It is not yet obvious, but soon will be, in my opinion, and in Professor Grannis', that students have even less real say in what happens to them in the corporation school than in the factory school. So complex are arrangements that must be planned ahead, that little room is left for accommodation to changed needs or altered circumstances among students. Timetables are too complicated to change, plans are too involved to be altered or the programmed material is in print and can't be wasted!

But the third model that Grannis puts forward is not entirely satisfactory either, for while it is most appropriate in the primary years, it is apparent that the <u>family</u> model of school is not realistic as children become older and closer to the institutions of adult society. And yet we find the pervasive patterns of the factory still govern many primary and junior schools - I recently saw an open-plan school with a production line operation based on standardized textbooks and uniform final examinations that completely negated the potential of the building. The <u>interpersonal relationships of the family</u> and <u>the pursuit of the interests of the pupils as starting points into the sub-disciplines of knowledge</u> must be characteristic of all schools - Kindergarten to Grade 13. I do see, however, that in the

Intermediate and Senior Divisions, more organized activities need to be carried on - something like the kind suggested in "Living and Learning", and along the lines suggested by the Minister of Education in his announcement concerning the reorganization of secondary schools last week.

In summing up these very general remarks, I'd just like to remind you that the factory model has been with us, the corporation is developing swiftly, but my hope is, that with luck, foresight and considerable effort, we'll be able to push right on through to a new dimension of educational organization where our organizational patterns, and our buildings, will reflect our concern for the individual and his needs. We must plan ahead, we must have Program Planning and Budgeting Systems, we must have some measure of coordination in schools, some degree of timetabling, joint planning, and so on, but we must be sure to leave elbow room for each student and teacher, for each individual to be an individual. Buildings must not lock in any one institutional model.

Perhaps the geodesic dome is really what we should build!



The run-of-the-mill school is hard, it is a place for hard children and hard teachers, a place for people who like to be clean, efficient, organized. Very hard people do well in the run-of-the-mill school.

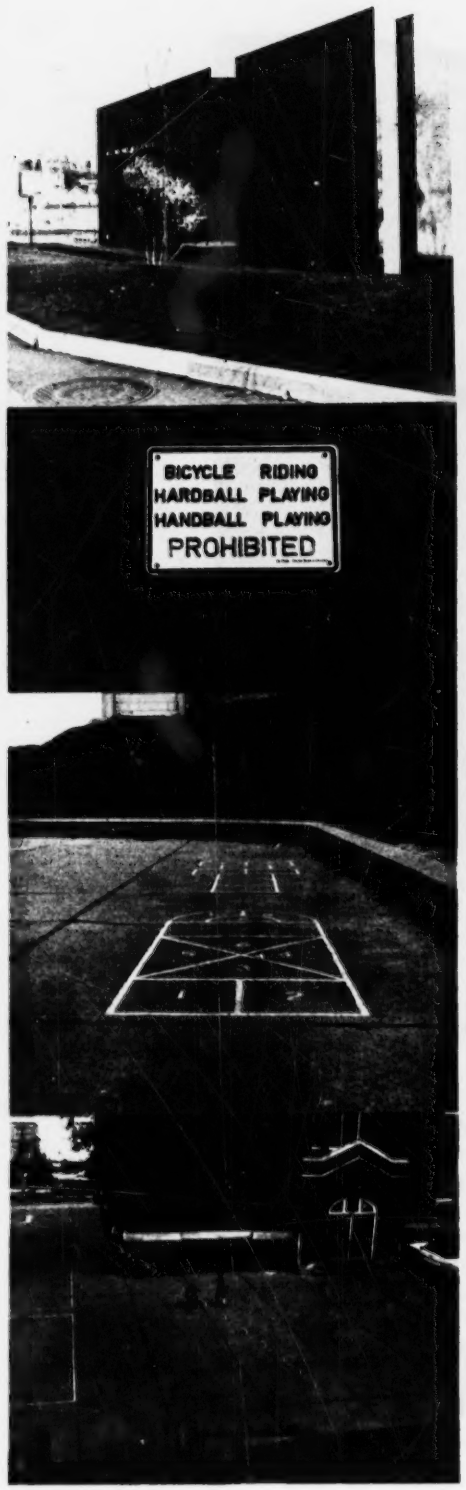
A free school is soft, it is a place for soft children and soft teachers, a place for people who like to be filthy, easy-going, inspired. Very soft people do well in a free school.

Most people are neither very hard nor very soft; they do not do well in any school.

Let us design a school where everybody wins. Hard teachers, soft teachers, hard children, soft children, and all the people in between. A school which gives a child a chance to explore a full spectrum of people and of environments.

THE HARD SOFT SCHOOL

Anthony Barton



It appears that there was an information explosion in the realm of finance before the stock market crash of 1929. Now it seems that there is an information explosion in education.
Pieces of paper are exchanging hands, but the exchange bears less and less resemblance to the real-life education of children, most of which now takes place outside the schools. Paper studies, paper seminars, paper diplomas and paper tapes carrying records of student attendance, age and grade: information on which to base provincial grants, not information of help to students trying to learn ... all this is an overexpansion of credit.
The learning which is going on in our schools does not seem to justify the mountain of paper in departments of education and research institutes. If our self-interest does not permit us to put a match to the mountain, let us at least change the schools to permit learning which is more relevant to the present day. Let us have new schools which provide the kind of learning which it is very difficult to obtain in everyday life: the valuable kind. Instead of rationing facts, let children learn ways to think, ways to manipulate concepts, and ways to understand and to work with film, television and sound: the pen, pencil and paper of the electric age.

If we can raise the true value of education to something approaching its paper value, we can stave off for another decade the Education Crash, the day when we tear up the journals of applied psychology, attendance sheets, and all the paraphernalia of the Myth.

So we need a new kind of school.
Should it be hard or soft?

A barred gate in a brick wall opens into an asphalt playground. A notice on the wall reads BICYCLE RIDING, HANDBALL PLAYING, HARDBALL PLAYING PROHIBITED BY THE TORONTO BOARD OF EDUCATION. Grade Five children are standing in groups, one or two are skipping. An electric bell rings and a teacher marshals the children into a line. They walk up three steps and enter the concrete school building.

Inside, they are marched down a wide, clean corridor, their footsteps echoing. Private lockers line the corridor, all identical, every one secured by a combination padlock. The children are led into a classroom and seated in alphabetical order at desk-chairs with built-in book racks. After calling the roll, the teacher talks to them about Canadian History for forty minutes, using an epidiascope to project onto a canvas screen some illustrations from the textbook prescribed for the course.

The teacher talks to them about Logarithms for the next forty minutes, pausing from time to time to ask questions, to maintain order, and to dictate examination notes which the children write down on the left-hand pages of pre-ruled hardback notebooks with one-inch margins.

There is a twenty-minute break during which each child consumes half a pint of milk, followed by a practical science lesson in a laboratory with waxed benches, identical stools, identical gas-taps and identical sets of apparatus. During this lesson, all the children perform the same preconceived dummy experiment and write a third-person account under the headings OBJECT, METHOD and CONCLUSION. This is followed by an art lesson in which each pupil is seated twelve feet from a daffodil and told to draw it. Lunch, prepared by a catering staff, is eaten in a self-service canteen, served in stainless steel trays with compartments for meat, vegetables and dessert. After the meal there is a compulsory rest period and then organised team games. The day ends with forty minutes mathematics drill in a classroom equipped with thirty computer terminals dispensing the same programmed instruction to all.

A tangle of mud, trees, grass and children's constructions leads gradually into a covered, heated area. As the ground changes from mud to linoleum, a wooden grid appears low overhead. From this lattice of unfinished pine, many things are hanging: electronic sculptures, measuring instruments, polythene curtains, stage-flats, mirrors and microphones. The grid carries power and communications outlets and is festooned with mobile lamps and television screens. It is so low that an adult has to stoop, thus it is within easy reach of most of the children, some of whom are climbing about on top of it. In one corner, they are setting up the lighting for a protest play about the slavery of newspaper delivery in their locality. In another corner, a Spasm Band is

rehearsing. In the middle of the open area, a group of five talkative children have hung mobile walls in a rough circle to make a projection room. They are discussing some slides which they made on a visit to a potash mine in Saskatchewan. Over on the far side of the area, there are three great bins; the first is full of paperback books, the second is full of scraps of film and tape, the third is a sea of magazines, journals and newspapers. A boy is rummaging in the film bin, and two girls are making a pile of magazines. Several children are lying and sitting by themselves, reading and thinking. The noise is indescribable.

Posters abound. Typewriters, paper and pieces of circuitry litter the floor. Safety has been built into the equipment and the environment: fire and electricity dangers are small. In the heart of the confusion, a teacher is busy painting a mural of dinosaurs; the children treat him as an equal and seek his advice on various matters from time to time. Close by, there is a computer terminal, a refrigerator and a large gas cooker, all in constant use. People pause in their work to make themselves coffee or to cook a meal for themselves or their friends. Occasionally someone leaves a group to wander outside and roll in the mud, or to gaze up at the sky and dream.

EDUCATIONAL ADVANTAGES

THE HARD LIFE

prepares children for the illogicalities and hardships of present-day regimented existence. WAR BUSINESS TABOOS.

points out the drawbacks of organized efficiency. FORCED TO READ SET BOOKS.

shows how boredom can arise from enforced activity and lead to inactivity. DOZING IN CLASS.

satisfies a child's need for simplified, structured surroundings. YOU KNOW WHERE YOU ARE.

permits nervous teachers to avoid personal relations with children. RETREAT TO THE STAFF-ROOM.

THE SOFT LIFE

prepares children for life as active individuals. TRY IT MY WAY.

points out the drawbacks of organized inefficiency. CAN'T FIND MY BOOK.

shows how boredom may arise from freedom, also, and lead to activity. MUSTN'T WASTE OPPORTUNITIES.

satisfies a child's need for diversity in exploratory play. THIS IS JUST A MODEL.

permits teachers to get to know children well, on equal terms. NO TALKING DOWN.

THE HARD-SOFT LIFE

enjoys the advantages of the hard and the soft. CONTRAST.

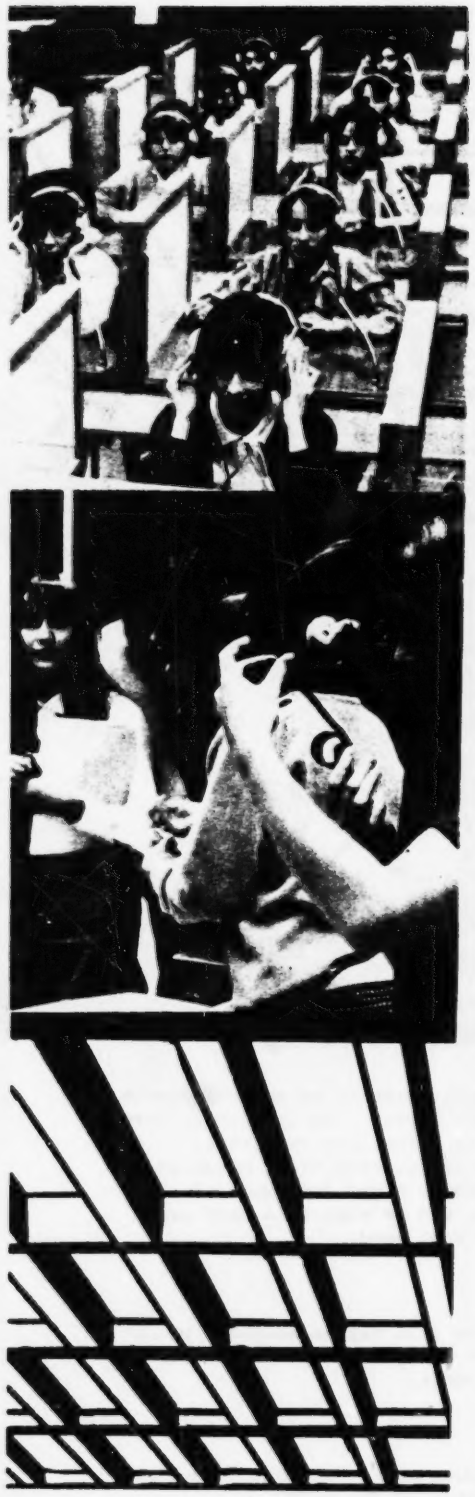
shows how environment affects people and their work. GRAPH PAPER AEROPLANES.

allows children to learn how to get the best of both hard and soft worlds. COMPUTERGRAPHIC PAINTING.

demonstrates the need to work in an intermediate zone. DRAMA IN A FRAME.

permits teachers to teach the way they like best. CHALKDUST FOR ME.

POOR ORIGINAL COPY - BEST
AVAILABLE AT TIME FILMED



The school needs:

Hard and soft in equal measure.
Both hard and soft have their advantages, both should be a part of everyone's experience.

A computer, tapping upon request a vast store of sound, vision and audiovision. The computer will help to push the information level inside the school above the information level in the television-soaked surroundings.

Flexibility. Free access to materials and equipment with which the children can manipulate the modern media.

Courageous architects, with the imagination to include purposeless structures and interesting but unlabelled areas in their school designs. Children can learn a great deal by completion: an educational structure should be incomplete.

Untrained teachers, as well as trained professionals. Artists, scientists, craftsmen and technologists should be paid to carry out part of their work in the school environment where they can interact with the children. Ideas will flow both ways.

Links with the world. Children should work, but not in a classroom to no immediate purpose. Their school should help the community. They themselves should carry out practical projects such as the relief of the elderly or the laying of school sewer-pipes. Children need to visit law courts and power stations with an aim in view: to discover the laws relating to the care of the elderly, or the ways to imbed piping in concrete. They are easily bored by conducted tours in which they are mere observers, tiny tourists.

Courageous School Board Members. These community leaders must be as willing to experiment with buildings as with gadgets and expensive computers to do payrolls.

PROPOSAL: The school should be designed and built with a physically hard area leading to a flexible intermediate zone which in turn fades into a physically soft area.

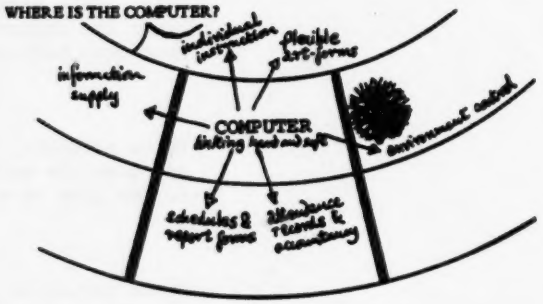
Alternatively, the school might consist of hard, soft and intermediate modules in a pattern. The idea is to embody in the design a complete spectrum of environments, to help a child learn better how his surroundings affect him and what he does.

An intermediate zone seems to be an inescapable part of a hard-soft system. In this zone, hard structures, such as television receivers, screens and thumb tacks, have to be moved at will. This requires a rigid framework of power and support, and we suggest a hard overhead grid made of soft wood.

Where possible, the grid may be extended up and down the walls, to give greater flexibility to the area as a whole.

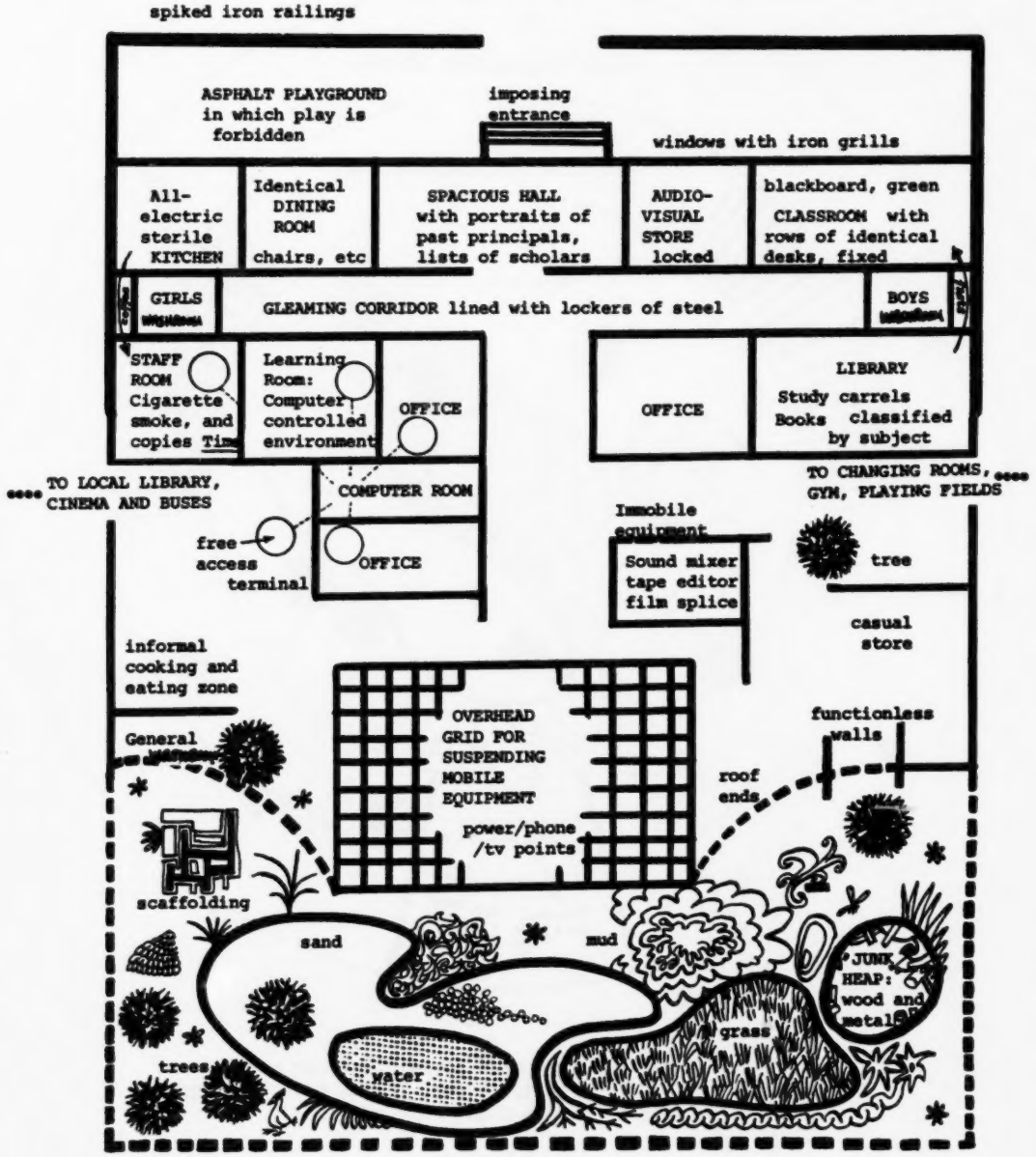
There should be power and communication outlets at every intersection of the grid.

WHERE IS THE COMPUTER?



The hard-soft school might look something like this:

HARD



SOFT

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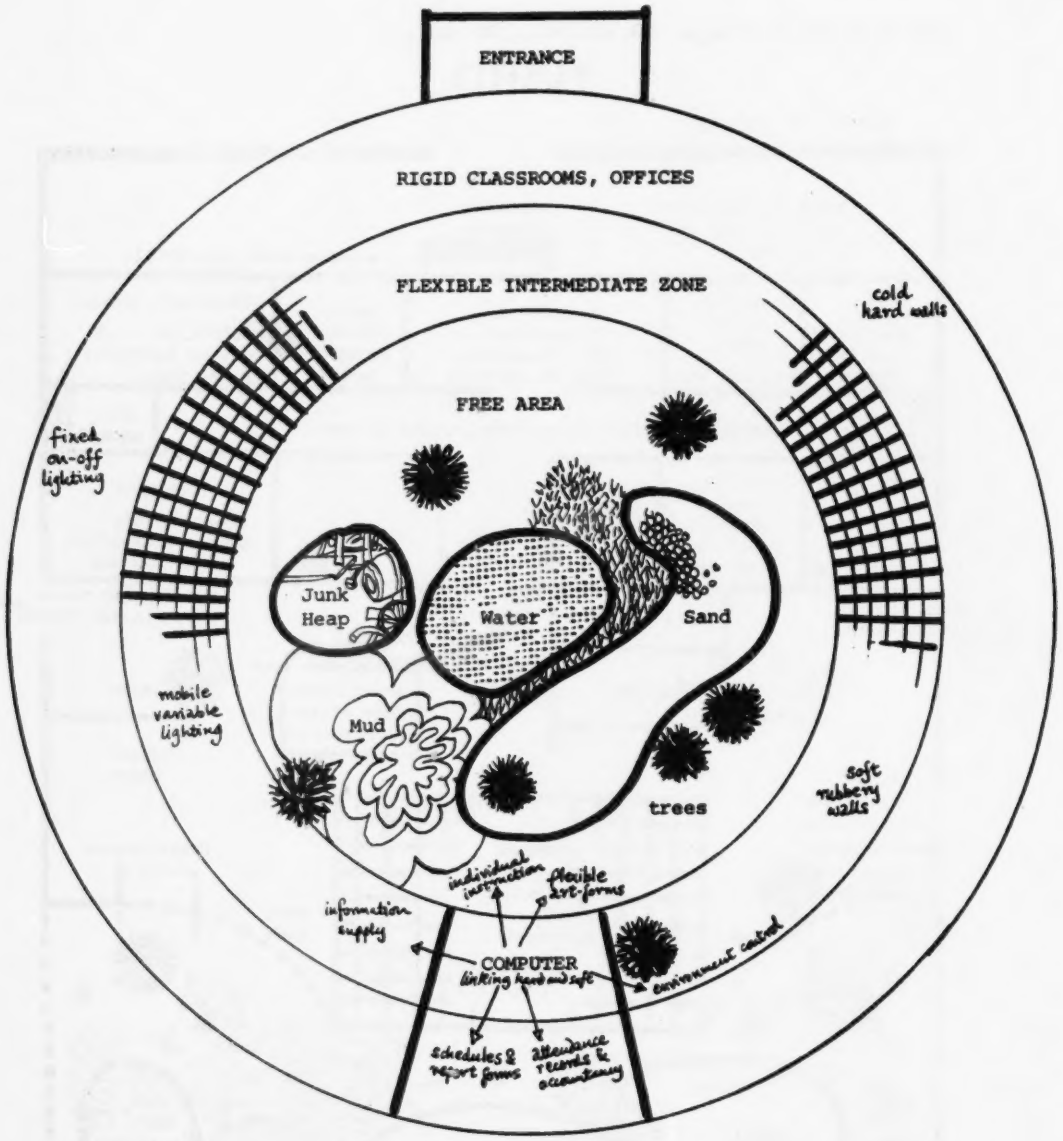
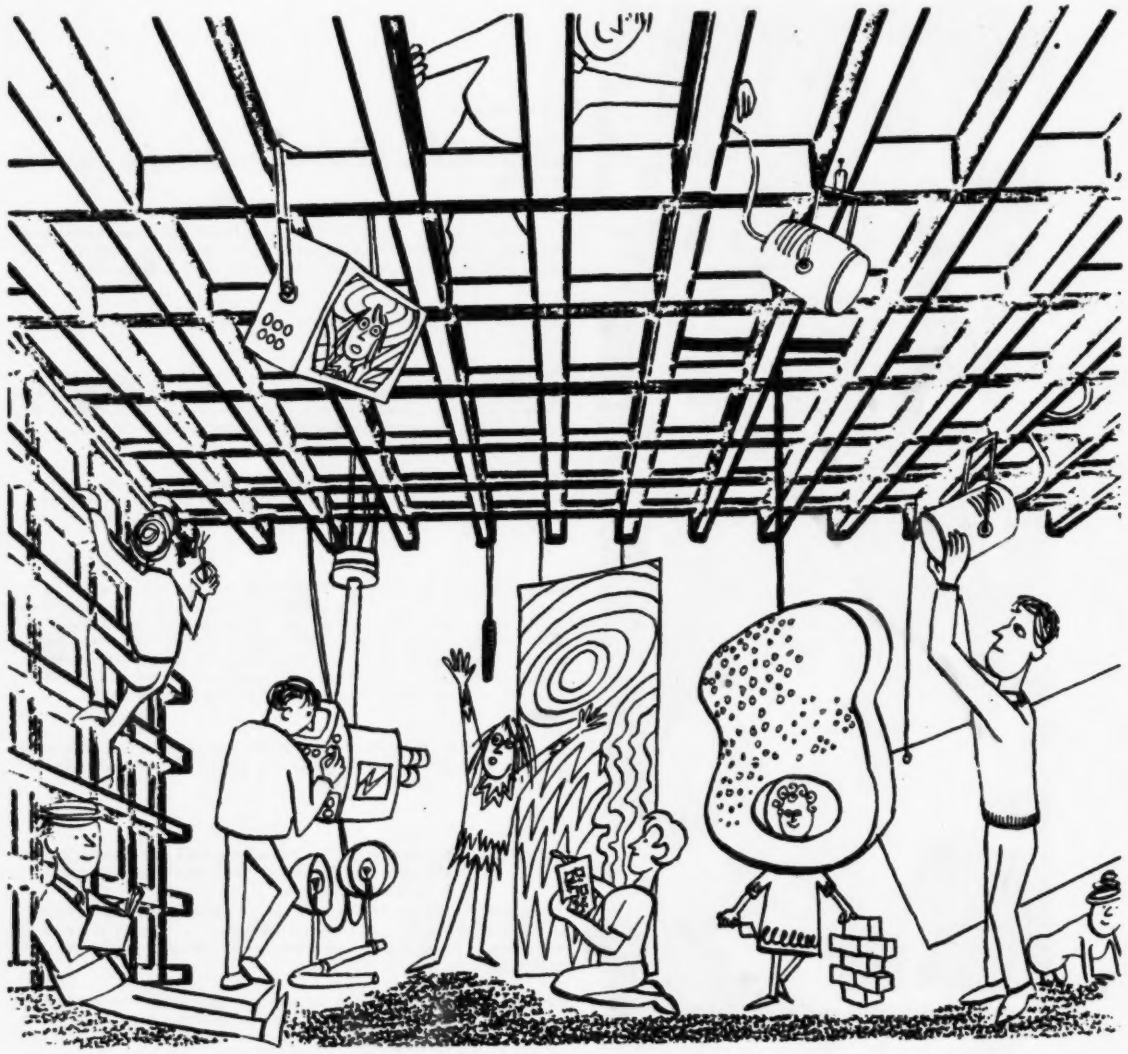


The hard-soft idea can take many forms. It is an educational suggestion, not an architectural one. In the hands of a good architect, surprising things might come of it.



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Where possible, the grid may be extended up and down the walls, to give greater flexibility to the area as a whole.

There should be power and communication outlets at every intersection of the grid.

WHERE IS THE COMPUTER IN THE HARD-SOFT SCHOOL?
IT HAS TENTACLES.

It would be a mistake to draw clear boundaries between hard, intermediate and soft. The computer itself might have to be situated in the hard zone, but its terminals could be placed in both the hard and the intermediate zones. A terminal or two might even find its way into the soft zone; that would be a milestone in education: a computer terminal in the mud.

The terminals in the HARD zone are used for organizational work, record-keeping, accounting, budgeting, scheduling. (There may be two computers in the computer room, one for this kind of thing and one for educational purposes.) The terminals in the SOFT zone are used for free interaction with the machine, indescribable.

The terminals in the INTERMEDIATE zone are situated in a computer-controlled environment. Each terminal sits in a room of its own and the computer controls the lighting, sound, smell and tactile surfaces of this room.

BRICKS ARE NOT ENOUGH

What would happen if a hard-soft school were built and placed in the hands of teachers who did not understand it? They would turn the flexible grid into a gymnasium, screw electric bells onto the trees, remove the junk, level the mud, and put up signs saying KEEP OFF THE GRASS. It's a hard life.

So we need new teachers for new schools, people who can change their teaching to match their surroundings, and do it all day. Are there flexible, committed teachers who can splice videotape, discuss the subconscious and climb trees? Yes, there are good teachers.

PEOPLE ARE NOT ENOUGH

Good teachers exist, but they have few schools worthy of them. Those that stay in teaching tend to take on slowly the shape of the hard-walled mould.

BUILD HARD-SOFT

Give them the schools real teaching needs. Half-measures will not do. There is at present a trend toward semi-flexibility which is deceptive in that it is an architectural answer but not an educational one. There is little to be said for a mobile wall if it can be moved only by a teacher. Moving walls is education: children learn when they manipulate their environment themselves, because they want to do so.

We welcome your comments, criticisms and suggestions concerning the ideas put forward in this philosophical paper.
Write or telephone: Department of Computer Applications, The Ontario Institute for Studies in Education, 102 Bloor Street West, Toronto 5, Ontario, Canada.
Telephone: (416) 923-6641, extension 524.

The final pair of photographs.

Two schools built half a century apart.

Which would you say was the harder?

Keep your eyes off the grass.

HARD-SOFT EDUCATION: A READING LIST

HARD

Circular 14 Ontario Department of Education
(Classic document of educational bureaucracy)

The Republic Plato
(The idea of control as a basis for education. Dip into Book Two and watch the educator censoring literature, inventing state myths and moulding the character of the child.)

The Changing School Curriculum Goodlad
(A specimen from the mass of literature which accepts the idea of control blindly)

Teaching Disadvantaged Children in the Pre-School Bereiter
(The idea of control carried to extremes)

Programmed Instruction and Educational Technology Journal
(Consolidation of the hard position by myth and jargon)

Walden Two Skinner
(A novel by a behaviorial scientist suggesting indirect control)

SOFT

Summerhill Neill
(Account of a free school forty years old, by its headmaster)

This Magazine is About Schools Journal
(Accounts of Toronto's own free school, Everdale)

Rochdale College Calendar
(Free education at the university level)

Walden Thoreau
(Life in the Woods as a philosophical ideal)

Canadian Free Press
(Example of underground paper peddling the free life as pop)

INTERMEDIATE

Island Aldous Huxley
(Balanced education through experience in a realistic utopia)

Understanding Media Marshall McLuhan
(Hard formal education balanced by soft TV education in the home)

Misunderstanding Media Gordon Martin, National Film Board
(A paper pointing out how the hard school misuses the media)

Emile Rousseau
(The idea of allowing the child to develop freely in a hard frame)

Lord of the Flies Golding
(Novel about hard-reared children thrown into a soft environment)

OVERVIEW

SEF Report II The Metropolitan Toronto School Board
(Study of Educational Facilities)

(Quotes from Dewey, many references for further reading)

POOR ORIGINAL COPY - BEST AVAILABLE AT TIME FILMED

THE HARD-SOFT SCHOOL by Mr. W.A. Strong

The architect is experiencing the change in educational philosophy in a most pronounced way because he is building the New Schools. These are the schools where new ideas and techniques can be better put into practice because the surroundings are developed to suit them.

So from my point of view, the battle for a more flexible, relaxed, humanistic school has been won. These are the schools we are building now. And while the arguments abou: the new philosophy of education may not be finished..... indeed as a parent rather than an architect, I get into these arguments myself - architecturally speaking, the hard-soft school is here!

Advances in the use of audio visual media, the development of multi activity classes, and progress at a child's own rate seem to demand a change in the old hard school. The handling of the spaces - which is what architecture is mostly about - has to be changed. For development and change in curriculum, in the way the child works, learns and progresses, seems to be inseparable from changes in the design of the school itself. It must be easier for a teacher to adopt a more flexible program in a room or space with flexibility built in.

That said, I might add that we have advanced architecturally quite rapidly in the last few years and I am conscious that the time may have come to re-evaluate correct, and improve on some of the changes we have designed into the new schools. What I mean is, that the architect cannot know whether movable partitions and all the rest work well in the teaching situation. And it is up to the educators to tell us where and when we have gone wrong; and I would suggest a field group of educators and architects to report this year on our combined progress.

Now, speaking as an architect with some knowledge of school design and leaving the field of educational philosophy completely, I would like to point out that you can't possibly have a completely flexible, completely unordered space in which education is going on. One has to structure space for certain functions within a school. One has to consider noise, odors and safety factors.

This is so obvious that perhaps it has been missed by some of the more radical proponents of flexibility. The Ontario Fire Marshal's office, for instance, is concerned that science rooms and home economics rooms be walled off. There are washrooms, gymnasiums, private counselling rooms, industrial shop and the service areas that have to be separated from the rest.

Where we can be flexible in the handling of space is in the resource centre, the kindergarten and the general classrooms. Architects can meet the new demands for flexibility in these areas and produce imaginative plans that incorporate the educators requirements.

But it is important that the educator assess the impact of these changes and not merely shift the educational problems that arise to the architect. I guess what I mean is that if some of the new ideas in design and handling of spaces don't work out in practice for the principal and his staff, he shouldn't blame the architect. For in demanding flexibility, the educators have often been vague. Let us have programming developed more specifically.

Neither the educators nor the architects are trying to make changes in school design purely for changes' sake. We are both trying to make education more effective. And of course, in the process, both architects and educators do a certain amount of "learning by doing" - a concept which I assume has your wholehearted endorsement. As we build schools, we learn how to design and build better schools.

It has to remain a cooperative effort, and I can't emphasize this enough. The program requirements have to come from the educators, and the architects cannot solve your educational problems.

One field in which I can perhaps contribute some knowledge is the field of costs. The new flexible schools are more costly than the old hard schools because carpeting, for instance, required for sound control and floor resiliency can increase square footage costs by approximately $1.00 per square foot over vinyl asbestos tile.

Large open column-free areas increase structural costs by twenty-five to fifty cents.

Flexible and operable walls vary in cost from $5.00 to $10.00 a square foot against $1.15 for a painted block wall or approximately $3,000.00 - $6,000.00 per classroom versus only $800.00 a classroom.

It is in this field of building costs that the architect can make a real contribution to the educator's problems - the educator who has all these wonderful ideas but is spending the tax-payers money and has to watch his costs.

We can offset these costs for you. For instance, if you carpet the floor, we can suggest eliminating the acoustic tile ceiling.

You don't have to have column-free space to be flexible in my opinion. You can group wardrobes or project counters around columns. That is, you can have the columns but not the walls - this is less expensive than large spans.

Flexible walls are really expensive and if your slick partitioning system requires two strong men and a ninety-eight pound teacher to open up or close a wall, you defeat the concept surely, through the inertia of the teacher. You can provide open teaching areas in small clusters and utilize cupboards and movable chalk and tack board to separate area.

In summary, the new flexible schools do at the moment, result in approximately a $1.50 per square foot extra to the tax-payer.

The architect then,by inclination and design, is an innovator when it comes to the school. He is interested in new ideas in education and anxious to design schools which will make these ideas effective. But he cannot tell the educators what a school should be like. They must tell him. Then at that point, he can have some good and useful ideas about how best and most economically this educational function can be carried out.

THE COMPUTER AS A TEACHING AID IN THE SCHOOL PROGRAM by

Mr. G. Bonham

The computer, as a teaching aid, can take so many different forms that one of our problems this morning will be to keep track of them all. However, if we approach the problem by first describing each requirement and then trying to find a solution to meet that requirement, the most logical overall solution should emerge.

First I would like to show you the courses involving the computer that are either available right now or will soon be available. From the chart, you will notice that there is a program available in each of the three streams: Business and Commerce on the left, Arts and Science in the middle and Science, Technology and Trades on the right. Actually, in any of these programs, the computer is more of a learning aid than a teaching aid but in either case, it is an integral part of the program.

Starting with the Business and Commerce program which was the first established, we will approach course content not from a philosophical point of view but instead from the point of view - where is a computer needed? For instance, the Grade 10 program can be taught without using a computer but the Grade 11 course cannot. The course is called basic programming and the objective is to introduce the student to programming and not, by the way, to make a programmer out of him. Therefore, to meet this objective, access to a computer is absolutely essential.

Similarly, the students must have access to a computer in the Computer Science program of the Arts and Science branch. Here the emphasis is on problem-solving that is, a study of algorithms. An algorithm is a step-by-step solution that must be infallible for all cases of input. The teacher could check an algorithm for infallibility but he wouldn't last long. Therefore, let's give the problem to a computer because a computer just happens to be a very competent "algorithm-checker". Thus once more, access to a computer is essential.

In the third program which is more embryonic than the other two and which does not yet have a Department of Education course of study associated with it, the use of the computer will be somewhat different. In this course, the students will learn about the circuitry of the computer; all about switches, triggers, logic subsystems and any other electronic elements utilized in the computer. To meet this need, they will require suitable hardware for "hands-on" experience. Simple circuits can be "breadboarded" quickly for analysis of operation. For the study of more complex circuitry, however, computers, or computer sections which are so constructed as to permit measurement of operating conditions, would be valuable.

In addition to this "hands-on" experience with the circuitry, the students of this program will likely write some programs, so in that sense they need the same kind of facility as do the others.

In summary, then, the type of facility required to support all three programs is one that will process student programs; and there is the extra requirement of access to circuitry in the S.T. & T. program.

Now let's look at some of the possible solutions to meet these requirements. You probably noticed that I used the words computer facility rather than computer. The reason for this is that the facility can take so many different forms. For instance, it could be a computer in the school, so let's explore that for a moment. At the present time, there are at least eleven schools in Ontario that have computers installed. There are five manufacturers represented; they are: IBM, Honeywell, General Electric, NCR, and Digital Equipment. There may be others of which I am unaware and, if so, I stand corrected. The machines installed range in price from approximately $8,000 purchase to approximately $120,000 and, of course, there is a corresponding variation in computing power. The important note here is, however, that <u>the type of computing equipment really doesn't matter insofar as the learning situation is concerned</u>. There is a fairly high transfer rate of knowledge as one uses various computers. Moreover, the stress is either on concepts or on problem-solving in all the programs. The <u>concepts</u> in computing are independent of type of machine and so is <u>problem-solving</u>. Therefore, the only requirement is some sort of hardware and the best hardware will be that which does the best job on student programs. Once the hardware has been decided on, another problem must be faced; where to locate it in the school. Most of the schools that have computers installed are putting them in rooms partitioned off from regular classrooms. It is desirable that access to the classroom portion be maintained but also access to the outside hall is required so that students can come in and use the computer during their free time; even when a class that is not using the computer is going on next door. Because of this, the partition should be fairly soundproof. Also, it is desirable that the teacher next door keep an eye on proceedings since the machine is quite an investment. Therefore, the most popular partition wall is one that contains a large percentage of glass. In general, this is the type of computer room that is being built and, as far as I know, is working out very satisfactorily.

At the present time, the computer room is generally under the supervision of either the mathematics head or the commercial head. It has worked out this way because these are the people who have been involved with the courses that I described a moment ago. It is my hope that two things will happen that will alter this somewhat. First, I hope that computing will be used in almost every subject although the present courses with their special emphasis on computing will still remain. For example, a geography class could use a computer to investigate the effects of border changes or population shifts. A biology class could use it to simulate bacteria growth, and so on. Secondly, because of this wider use of the computer in curriculum, I hope to see the computer as easy to get at as, say, the office duplicating machine. This machine knows no subject boundaries and neither should the computer. Trends in hardware development lead me to believe that computers will become more and more automatic and much less esoteric. Hence, the school of the future, may have a computer room accessible by students, staff, principal, and office staff.

What about the requirements of electronics students? Should they have access to the circuitry of this general purpose computer that I have just described? The answer to this largely depends on the utilization. I see no particular harm in having them check circuitry with oscilloscopes and other test instruments but remember that the computer is

inaccessible for anything else during this period. Therefore, if utilization is high, I would suggest that its "down-time" be kept to a minimum. Hence, it would be wise to take the computer sections approach and have various parts of the computer in the electronics shops. This also has the advantage that test equipment doesn't need to be moved around quite so much.

Let's summarize here by considering this situation to be the first under consideration; that is, a computer in the school for processing student programs and parts of computers available for the electronics students.

There are other types of access to a computer; for example, regional centres. There is a rule of thumb for computers that says: if you double the price, the computing power goes up by a factor of four. Thus a large school system may find it more suitable, particularly financially, to have a large central computer and bring student programs, teacher programs and so on to the computer. This is being done already in some of the Metropolitan Toronto boards which have courier services established for picking up and delivering programs. If this is done, the computer facility in the school becomes simply a place to leave and pick up programs. The only factors here are logistic in nature.

A variation of this large central computer approach is to have computer terminals located in the school. Here there are variations as well but most terminals will be of the type that transmit over voice-grade telephone cables. If the terminal is portable, and it likely would be, it may be desirable to put it on a cart and take it to the geography room for the geography class and the mathematics room for the math class and so on. This would require telephone jacks to be installed in various rooms, but how do you predict which rooms? This, I would say, is impossible to guess at but perhaps in planning construction it may be possible to make it quite easy to install telephone jacks in any room. I don't know the expense involved here - it may be too high to do but then again, it may not.

Still other computer facilities are mail-in services to a number of different agencies such as universities, commercial firms, colleges of applied arts and technology and teacher-training institutions. This type of facility is essentially the same as the courier set-up and the factors are all logistic.

Choosing the best facility is a real problem. It wouldn't be so bad if manufacturers would declare a moratorium on new products so that we could decide what is best from all the presently-offered products: but this is hardly likely so we have to remain as flexible as possible. If I had to decide right now, I would do so by considering two trends that are rather important. First, technology is advancing quickly in the communications area, making communications cheaper and better. Secondly, technology is advancing quickly in computer development. Computers are getting faster, cheaper, smaller and easier to use. If these trends continue, and I fully expect they will, then I would favour the installation of a small computer in the school that has the facility of being a remote terminal as well. By this I mean that it should have the capability of doing all the "in-house" student programs but in addition it should have the capability of being hooked up by a telephone network to a large remote computer. This remote computer will be used for centralized collection of data, for solving very large student problems, and for storing data to be used in information retrieval by the schools.

The computer at the school should be accessible by all persons that I described earlier. Just where to put it in the school, I don't honestly know. Perhaps the best location would be close to the school office for ease of use by office personnel and as remote as possible to conventional classrooms so that students can go in and out without disturbing other classes.

This is what I personally would choose at the moment. But I don't know what developments are just around the corner and I may change my opinion tomorrow; but, just as I have made a decision as to what I think is best at the moment, so will you likely have to make a decision; and all you can do is to assess the factors as you see fit and try to remain as flexible as possible.

One of the areas that I haven't even touched is computer-assisted instruction but I think CAI is much more remote than using the computer in the ways I have just described.

Also, it seems to me that the planning of facilities for independent-study carrels parallels the planning for CAI. Perhaps part of the study carrel will be a computer terminal to be used for CAI. If so then adequate cable facilities will be required, probably an infinite raceway in the floor. The cable connections might be coaxial cable or they might be voice-grade telephone lines. I believe that this depends on where the computer is located. However, CAI is still fairly remote for us and, while I agree that planning for it is important, I wish to stress this morning a shorter range of planning and that is, the provision of a computing facility for our children.

PHYSICAL AND HEALTH EDUCATION FACILITIES IN SCHOOLS

by Mr. J.M. Metcalf

PART A

It is certainly not my intention to consider with the group any of the technical aspects of architecture or of building construction. What I do feel some competence in, and what I would like to discuss with you this morning, is the question of the function and the use of physical and health education facilities in schools, and those aspects of design and construction which may make this function either more, or else less, effective. Certainly, my involvement with these kinds of facilities - as a student, an athlete, a teacher, a coach, a department head, a director of athletics, an inspector and a program consultant - has always been from this point of view of function.

In order to appreciate function it is necessary for one to be aware of at least the basic principles and programs in school physical and health education today. Perhaps more than any other subject field, physical and health education faces the danger of being stereotyped. This danger of being 'cast in a mold' derives from the old "PT" programs which consisted primarily of Danish calisthenics, military drill, and a "play the game" situation in which ten people played while the rest awaited their turn. Activity programs were generally based upon the "big four" of football, basketball, volleyball and track and field, with a little gymnastics sometimes thrown in for the open house display, and a little softball in the late spring.

Health instruction often consisted of a watered down course in anatomy and hygiene, with a lecture presentation, and with copious note-taking on the part of the students so as to be able to regurgitate the information on a test or examination at some later date. The setting for this type of health instruction was not particularly important.

Today's physical education programs include approximately

twenty eight activities in which the students may be involved during their school experience in the subject. The immediate aims of the program are the development of a high level of total, personal physical fitness, and the development of each student's kinesthetic abilities - his perfection of the art of movement and the efficient utilization of the body in movement - through the medium of athletics and physical activities. There are also extremely important long range objectives in the program - particularly in terms of mental and of psycho-social development.

In order to accomplish these aims and objectives the four key words are "movement" - "involvement" - "activity" and "individualization". The subject matter of physical education is movement - and movement requires space. It is essential that all students in the class be actively involved for the greatest possible amount of time. Physical education programs today are structured to achieve maximum activity by all class members, at a level suited to their individual abilities, aptitudes and interests. In general, the effectiveness of a physical education lesson is in direct proportion to the amount of equipment used, and is in inverse proportion to the size of the individual groups engaged in the activity. The implications in this concept, with regards to the need for space and for "good" facilities, are most obvious.

Health education today focuses upon student involvement and student discovery. It utilizes such activities as large and small group discussions, discovery situations, experiments, demonstrations, role playing, debates, laboratory situations and student presentations. Enrichment through the use of aids, models, charts, audio-visual equipment etc. is most desirable. A specific environment for this type of educational experience is practically essential.

PART B

With regards to specific facilities for physical and health education - both gymnasia and ancillary areas - I have listed many of the desirable features in point form in the printed version of my talk, and on the overheads which I will be using in a very few moments. I would like to cover the specifics of the individual areas rather quickly, with comment only upon those situations where problems often tend to occur. Hopefully you will then raise, in the discussions which are to follow, any points which may be of particular interest or concern to you.

While my focus in this talk will be primarily upon facilities for secondary schools, many, indeed most of the general principles - particularly with regards to gymnasia, change rooms and showers - will apply equally to the facilities in K-8 schools. Although I will, of necessity, be speaking about the "ideal" situation, I realize only too well that there are many variables - economic, school site previously existing facilities and so on - which must enter into the deliberations of those involved in planning and constructing new facilities. And of these, without any doubt, the economic variable has to rank number one.

In considering the total physical education facility the initial focus, from the point of view of function, should be - not upon the gymnasium - but upon the change room. (PROJECTUAL) There must, of course, be access from the change room into the school building. There should also be direct access doors or openings into the gymnasium, the instructor's office, the drying room, the toilets and the outdoor facilities. Access to the showers should be only through the drying room. The instructor's office should also have direct access into the gymnasium and into the school corridor. Ideally, six kinds of storage should be provided as shown on the overhead. (Four - heavy equipment, supplies in daily use, chair, and community-opening directly into the gymnasium; one - outdoor storage - opening only into the outdoor facilities; and one - dead storage - located in the general area.) Within the general physical and health education complex, but not necessarily opening into any of the above facilities, should be the health education room, the dead storage - team room complex, and any other ancillary areas.

On the projectual, red lines indicate that there should be doors - green lines indicate that there should be openings to separate areas, but no doors. (Openings only, between change room and drying room, drying room and showers, and change room and toilets.) However, each area should be separate and self-contained.

(SERIES OF PROJECTUALS)

GYMNASIUM NO. 1 Capacity:

Formula: $\frac{\text{School Capacity}}{\text{Average Class Size}} \times \frac{\text{Number of periods per class per week or cycle}}{\text{Total Periods per Week or Cycle}}$

e.g. $\frac{1500}{30} \times \frac{3}{42} = 3.57$

$\therefore$ 4 teaching stations are required

$\frac{1500}{30} \quad \frac{1}{42} = 1.19$

$\therefore$ 2 health education rooms are required

GYMNASIUM NO. 2 Location:

- Separate, so that noise will not interfere with other classrooms.
- Capability for closing off the complex from the rest of the school, particularly if community use, and the concept of the "lighted schoolhouse" is being considered.
- Need for easy access to outdoor facilities.

GYMNASIUM NO. 3: Size

High Schools and Collegiates:
- Single Gymnasium: 80' x 50'
- Double Gymnasium: 80' x 100'
- Minimum Height: 22' clear.

Senior Public, and Junior High Schools:
- Single Gymnasium: 70' x 45'
- Double Gymnasium: 70' x 90'
- Minimum Height: 20' clear

K - 6 and K - 8 Schools:
- All Purpose Room: 60' x 50'
- Double All Purpose Room: 60' x 100'
- Minimum Height: 18' clear

GYMNASIUM NO. 4: Floor

- Hardwood preferable to parquet or tile
- Built-up is superior to flush laid
- Proper location of floor sockets and plates is most important. Socket other than the "sleeve" type are generally not effective.
- Sockets to support the horizontal bar should not be centred on the floor, but should be to one side, and preferably towards one corner.
- Care should be taken to ensure that all court and floor markings conform to the latest rules and regulations as laid down in the current official handbook of the sport concerned.

GYMNASIUM NO. 5: Walls

- For at least the first 16' from the floor and preferably for its entire surface, the wall must be clear, and as smooth as possible. There should be no projections, decorative brick work, acoustic treatment, mid-wall heating apparatus, glazing etc. Otherwise all rebounding, which normally constitutes a considerable amount of gymnasium activity, is impossible.

- There should be a washable, protective coating for the first 12 feet.

- All external corners should be rounded.

- All basketball backstops should be swing-up or swing-away in order to make the total floor area - particularly cross court - available for other activities.

- No drinking fountains in the gymnasium.

GYMNASIUM NO. 6: Roof Structure

- Recommended heights must be clear heights.

- Pre-cast construction magnifies the problem of acoustics. Reverberation time should not exceed 1.6 seconds.

- Attachments for ropes, rings, etc. in pre-cast must be placed carefully in order to avoid problems.

- A suspended flush ceiling is very susceptible to damage.

- Ceiling design which traps balls, badminton birds etc., should be avoided.

GYMNASIUM NO. 7: Exits and Entrances

- There should flush floors, with no sills, at all entrances to the gymnasium.

- Traffic across the gymnasium in street shoes must be avoided.

- Doors should be flush with inside walls. Handles should recess.

- Doors should open outwards.

- Doors should be sufficiently sturdy to accommodate up to 800 "pupil passages" per day.

- Ventilation panels at the bottom of change room doors should be avoided.

GYMNASIUM NO. 8: Lighting

- Large glazed areas have several disadvantages.
  - i) Glare. Often covered with drapes which are never opened.
  - ii) Breakage
  - iii) Heat loss, or gain, and condensation.
  - iv) Limit use of walls as instructional aids.
  - v) Artificial lighting is still required.
  - vi) They are not needed for ventilation.

- The relationship between the colour scheme and the quality of light should be carefully considered.

- Minimum lighting should be 30 foot candles taken 4 feet above the floor.

- Light should be uniform. Dark and light bands should be avoided.

GYMNASIUM NO. 9: Ventilation and Heating

- Should be controls for gymnasium only.
- System should be quick responding. Hot water is not efficient.
- Relative humidity should be maintained at a proper level.
- Noise from air movement or from mechanical apparatus often creates problems.
- There should be a minimum of 6 air changes per hour. At least 50% should be fresh, outside air. The remainder could be re-circulated.
- Temperature should be 60-65 degrees Fahrenheit at 4 feet above floor level.

GYMNASIUM NO. 10: Folding Door

- Should be solid and capable of use for rebounding activities.
- Complete separation between the two gymnasia is essential.
- The hanging type of door is preferable. Floor track is not recommended.
- Allowance must be made for building settling.
- A small connecting door in the folding door is essential.
- When opened, the door should be completely recessed.
- If possible the storage for the open door should not infringe upon equipment storage areas.
- The controls for the door should be at the closing end of the door.

GYMNASIUM NO. 11: Electrical Outlets and Public Address

- A clock outlet should be provided in each teaching area of the facility.
- There should be a reasonable number of wall mounted convenience outlets in strategic locations.
- Wiring for an electric scoreboard should be installed at the time of construction, even if no board is planned for the immediate future.
- There should be a unit of the school's public address system in each teaching area of the facility.
- Lights should be controlled by more than just one master switch.

CHANGE ROOMS NO. 1: General

- These should be 550 square feet. (900 square feet for boys if a 350 square foot team room is not provided).
- Minimum of 9' ceiling height.
- Floors impervious and non-slip.
- Minimum lighting of 15 foot candles at 4 feet above the floor.
- Drains in the floor, including one close to the drying room entrance, are essential. Floors should be properly sloped to the drains.
- Should be a hot water hose connection for cleaning. Controls should prevent student operation.
- Sharp corners and projections must be avoided.
- Screens and baffles as visual barriers at entrances must be provided if required.
- Good ventilation is absolutely essential. The minimum is 6 air changes per hour with at least 50% being fresh outside air.

- Temperature should be 78-80 degrees taken 5' above the floor.

- K - 8 Schools: 400 square feet.

- The number of change rooms required in the total facility is one more than the largest odd number of teaching stations.

CHANGE ROOMS NO. 2: Organization

- Lockers and lockerettes are not recommended.

- Fixed benches, 16" wide and 18" high should be provided at all available wall space. They should be attached to the wall rather than to the floor.

- 5'-10" above the floor a 12" shelf should be provided above all benches.

- Hooks should be installed on the wall just below the shelf, at 15" intervals. Hooks with dual short projections should be used. Large, traditional style coat hangers are most ineffective.

- Mirrors should be conveniently located on the walls.

- A clock and school PA loudspeaker should both be provided.

- There should be a drinking fountain in the dressing room.

- A "valuables box" should be provided - either in this room or in the door between it and the instructor's office.

DRYING ROOM:

- Only way into showers.

- 150 square feet. Shape as nearly square as possible. Ceiling a minimum of 9'.

- No furnishings except for short, rust resistant hooks for hanging towels at 5' from the floor. (Towel rails are not desirable).

- There should be a 4" curb between the dressing room and the drying room.

- Light fixtures must be moisture proof.

- Good ventilation is essential.

SHOWER ROOMS NO. 1: General

- Accessible only through drying rooms.
- 225 square feet. Ceiling a minimum of 9'.
- As nearly square as possible. (15' x 15').
- Drainage. One or two conventional drains in the centre of the floor leads to problems. The room requires perimeter drainage, or a large, slatted drain between the dressing and drying rooms. Floors must be properly sloped.
- There should be a master control in a locked, recessed panel in the dressing room. It should not be in the instructor's office. Individual controls are not necessary, although one or two may be desirable.
- Minimum of 6 air changes. At least 50% fresh air.
- Moisture proof light fixtures are essential.
- Temperature 75-80 degrees at 5' above the floor.
- Lighting: 10-15 foot candles at 4' above the floor.
- Separate exhausting is most desirable.
- Soap holders and dispensers, if desired, should be recessed.
- Shower heads should be 56" from the floor.
- Hair dryers, if provided, should be in the dressing room.

SHOWER ROOMS NO. 2: Boys and Girls

Boys:
- 10 to 12 shower heads
- 6'6" from the floor
- Individual heads around the walls are more efficient than the pedestal, column or pillar type of shower.

Girls:
- The need is for individual cubicles with an attached change area.
- Six such are recommended.
- If the bulk of the showers are open, then at least two cubicles must still be provided.

TOILETS:

- It should be a separate room serving only the dressing room. It should not serve as a general school washroom. Access only through the dressing room.
- No mirrors in this room.
- No drinking fountain in this room.
- Boys: 2 toilets, 4 urinals, 2 washbasins.
- Girls: 4 toilets, 2 washbasins.
- Separate ventilation desirable. If not, exhaust must be from the offices and change rooms, to the showers, to the toilets and then out.

INSTRUCTOR'S OFFICES:

- 225 square feet. In addition to Physical Education Staff this room is used by other staff coaches, academic supervisors, and officials.
- Minimum height of 9'.
- Temperature 68-75 degrees.
- 25-30 foot candles at desk level.
- Washbasin, mirror, medicine cabinet, toilet and shower in a separate room or roomette within the office. Shower available for independent use.
- Provision to ensure that water from the shower does not escape onto the office floor.
- Locker accommodation for at least 6 persons.
- Vision panels, no more than 24" by 24" with the sill 4' above the floor, should be provided between the office and the gymnasium, and the office and the change room. One way glass should not be used.
- Good ventilation is essential.
- Normal unit of school PA should be installed.
- At least 2 duplex electrical outlets.
- There should be one office for the male staff, and a second office for the female staff. In open concept schools, or schools which plan to operate with individual timetables and/or electives, a common planning area between the two offices might be considered.

STORAGE AREAS NO. 1: Requirements

a) Heavy gymnastic apparatus
b) Supplies in daily use
c) Dead storage
d) Outside storage
e) Chair storage
f) Community group storage.

STORAGE AREAS NO. 2: Heavy gymnastic apparatus

- Double gymnasium: 700 square feet of usable floor space with openings into each half of the gymnasium.
- Single gymnasium: 450 square feet.
- Floor level with gymnasium floor.
- Heavy, overhead roll-up type of door, at least 6' wide by 8' high.
- Ceiling at least 8' high.
- Lighting recessed and protected.

STORAGE AREAS NO. 3: Supplies in daily use.

- 120 square feet of floor space
- One for each half of double gymnasium
- Directly accessible to gymnasium
- Shelving and cupboards on all walls.

STORAGE AREAS NO. 4: Dead Storage

- 225 square feet of floor space
- For storage of out-of-season uniforms, supplies, and equipment, and maintenance of ammo.
- Good ventilation is essential.
- Shelving and cupboards required on all walls.
- Should be provided with a Dutch-door.

STORAGE AREAS NO. 5: Outside storage

- Should open directly onto playing field. No other access.
- Sufficient in size to accommodate football blocking sled, blocking dummies, field markers, jump standards, shot and discus circles, shot and discl, hurdles, vaulting poles, field markers, lime etc.

STORAGE AREAS NO. 6: Chair Storage

- If the gymnasium is to be used for assembly and auditorium purposes, additional storage space to accommodate the maximum number of chairs required should be provided.

STORAGE AREAS NO. 7: Community group storage

- Separate storage should be provided, large enough to accommodate the equipment of all community groups who will use the facility.

TEAM ROOM:

- 350 square feet.
- Most desirable for large scale, after-school activities
- Only way to store and dry uniforms during the season.
- Leaves gymnasium area free for intra-mural activities.
- Showers and drying room would, ideally, be included.

VISITORS' DRESSING ROOM:

- A most desirable special service area, particularly in a large school.
- 350 to 400 square feet with 'its' own shower and toilet facilities.

ACTIVITY ROOMS:

- The provision of activity rooms in what might otherwise be wasted on poorly used space - e.g. over the gymnasium service areas - is most desirable.

STAGES:

- Only if absolutely necessary. The advantages of cafetoriums over gymnatoriums should be considered.
- The area of the stage should not reduce the clear dimensions set forth for physical education purposes.
- The stage should not protrude into the gymnasium proper.
- A net curtain should be provided to keep balls etc. from going onto the stage area.

SWIMMING POOLS:

- Swimming pools must conform to the "Regulation made under The Public Health Act respecting Public Swimming Pools".

- It is expensive. Close consultation with all possible user-groups in the community should develop to ensure maximum use.

- Plans and specifications for a pool and its ancillary areas must be submitted to the Department of Health.

I would now like to comment very briefly upon two remaining considerations. First, a specifically designed and designated health education classroom within the total physical and health education complex is practically essential if the meaningful experiences in health education, which I mentioned at the beginning of my talk, are to be provided for the pupils in the particular school.

(PROJECTUAL AND COMMENT)

My final remarks have to do with an extra benefit which may derive from thoughtful school planning. If the facility is so designed, a blank, smooth outside gymnasium wall - more than 100' in length and more than 22' high - can contribute towards an excellent outdoor area. With an asphalt area extending out from the base of the wall from 50 to 60 feet, an outstanding multi-purpose outdoor facility can be provided. The wall serves for rebounding activities, for the attachment of outdoor baskets and other equipment, and as a backstop at one end of the two or three tennis courts which could be provided.

These then are the outstanding specifics, once again from the point of view of function, for the various areas which constitute the physical and health education complex.

I would now like to presume upon just a few more moments of your time in order to illustrate, by means of some 35 mm slides, some of the points upon which I have been commenting.

(35 MM SLIDES AND COMMENTS)

I would like to thank Mr. Orlowski and the School Planning and Building Research Section of the Department of Education for the opportunity to speak with you this morning. I will certainly be available for the remainder of the seminar for anyone who might wish to discuss any aspect of physical education facilities in schools. I would also like to add that the Program Consultants for Physical and Health Education in the ten Regional Offices of the Department of Education - myself in Region 9 in Kingston, and others in the other nine Regions - are most ready, and would indeed welcome the opportunity to consult with you at any time regarding proposed new facilities for Physical and Health Education.

Thank you.

PHYSICAL EDUCATION FACILITIES by Mr. H.H. Roberts

A glance at the program for this Workshop clearly indicates that in general many people of diverse interests and capabilities have been brought together in an environment conducive to an exchange of ideas and opinion concerning the relationship between education and architecture. In each of the panel discussions and group meetings, speakers have been selected to represent the people who use schools and those who build them. I assumed, therefore, that for the purposes of this group meeting Mr. Metcalf as Program Consultant would address himself to the subject of Physical Education as a phase of total education; that he would deal in some detail with the needs of children and youth, the programs designed to meet these needs both now and in the future. I would then be expected to talk about the facilities to house physical education activities and perhaps comment on such things as safety precautions, appropriate materials, structures, and services. Having designed a number of gymnasiums and general purpose rooms, some good, some bad and some very bad, I feel qualified to speak about these subjects but do not intend to do so because I believe there are perhaps more important things to discuss before we start talking about the hardware. And lest you think I am avoiding the subject this may be as good a time as any to say that on March 11th I had the opportunity of talking to Mr. Andersen and Dr. Aboul-Khair of School Planning and Building Research and had the privilege of being shown the draft copy of a new and, in my opinion, a most exhaustive treatise on General Purpose and Physical Education Facilities. Virtually every aspect of the subject, from site planning to the height of a bench in a change room is dealt with completely and competently. Mr. Andersen stated that he was hopeful of having the manual ready for distribution by the time this Workshop took place.

This is the third EA Workshop which I have attended motivated by an earnest desire to learn from the "Educator" the facts about the learning program so that I as an architect could design a better school. Imagine my initial dismay then when I discovered that of all people the leaders of the teaching profession had no definitive answers to give me. I was at once discouraged and angry. Smarting from accusations of building soap-box schools I proclaimed that if they can't tell me what they want how can I be expected to design a building to suit the educational process for the next fifty years. Fortunately anger sometimes provokes thought and I gradually came to understand that if the "Educator" could give me a definitive answer education is necessarily static and we are dead.

It is my belief that an architect or for that matter anyone other idividual, can no longer be delegated to produce the perfect plan. Such an assumption implies a mastery of the massive amount of knowledge now available in such diverse fields as sociology, environmental conditions, urban and regional planning, economics, automation, recreation, psychology, health and medicine. It is clear to me that the architect can not be a person characterized as one who draws pretty pictures, makes a lot of money, and whose total exercise consists of bending his elbow.

He must become a member of a team whose collective knowledge is tuned to today's wave length. Until and unless this happens on a wider scale it is difficult to foresee better school buildings and physical education facilities.

The "Hall-Dennis" report has this to say about Health and Physical Education.

"Since good mental and physical health are essential in achieving maximum benefit from the learning experience, this area of the curriculum deserves special consideration. In this connection significant trends in our society have emerged to demand the attention of those who provide learning experiences for young people. New forms of mental and physical stress, changing codes of ethics, and new advances of leisure time have placed new responsibilities on the school. In the face of these trends, from drug consumption to spectator sports, from sexual ethics to physical development, the curriculum must demonstrate new ways of helping young people to meet the problems of reaching for emotional and physical maturity. It is not enough to provide the traditional series

of "health lessons" in the name of health education, or to provide regular periods devoted to popular team sports. Programs must provide, not the prescription of conventional courses, but learning experiences which will help young people in searching for solutions to the immediate problems that all young people face as they develop. For a boy of poor physical prowess, a sense of adequacy is just as vital as skill in games, perhaps more so. Likewise, freedom to ask questions and to get accurate answers regarding seemingly calamitous physical development is of greater consequence to a young girl than ability to name the parts of the body.

A good school will be sensitive to the emotional and physical needs of its pupils and will respond to these by developing programs that reflect this sensitivity."

If such an enlightened program is to be instituted or augmented and the proper facilities provided it seems to me that we must know who these children are and where they are. The Minister's report for 1967 provides the latest available statistics and in themselves have many things to say.

In 1967 the total enrolment in our elementary and secondary schools was 1,868,788 distributed as follows:

Elementary	
Enrolment	1,405,052
Increase over previous year	40,181
Secondary Schools	
Enrolment	463,736
Increase over previous year	27,710

Pupils were further distributed as follows:

Elementary:	Grades 1 to 6	- 55%
	Grades 7 & 8	- 15%
		70%
Secondary:	Grade 9	- 7.5%
	Grades 10 to 13	- 22.5%
		30%

The significance of these statistics is fundamentally important. The preponderance of elementary school children is startling enough without asking where, when and why one million children and youths went.

If the proposition that 50% of the total pupil enrolment is mentally incapable of proceeding beyond the Grade 10 level it may not be unrealistic to assume that something like 1,000,000 students have gone two years after leaving the elementary school.

The magnitude of the responsibility which this situation imposes upon the secondary school is difficult to comprehend, but in itself indicates the even greater responsibility of the elementary schools having in mind that all children will be taught by them while the secondary school, at the present time deals with only 25% of the total.

Unless we are prepared to accept a nation of spectators and widow makers unprepared for fifty-five or sixty years of automated leisure and tension we should then perhaps begin by examining our thinking and facilities at the elementary level.

Of the some 4,750 elementary schools in Ontario about 1,650 schools consist of one to six rooms; some 2,000 schools of seven to fifteen rooms; 1,100 of fifteen to over thirty rooms. It is quite probable that all of the 1,100 large schools, most of the 2,000 medium schools and some of the 1,650 small schools now have separate physical education facilities. It seems unreasonable to think that once built, existing facilities will or can be changed. It is fair to assume, however, that in time, new County Boards will consolidate smaller schools and it is in this direction and especially in the construction of new schools either urban or rural that we should look for the improvements of facilities.

Most general purpose rooms built during the last ten years or more conform to stipulated areas and ceiling heights in order to qualify for grants: the result being that the vast majority of schools possess a single room varying in size from 1,500 to 3,000 square feet more than likely with a stage added and most with a ceiling height of 16'-0" clear of obstruction. These figures in themselves invite

the following questions:

1. Why is it that one room should be 1,500 square feet and another 3,000 square feet if the group of children to be taught is twenty five to forty in each case?
2. Why must the ceiling height be 16'-0" clear?

The answers, of course, you know. In the first case the room is sized to accommodate the total student body and the second because the height is necessary for basketball and volleyball.

At this point assume three things:

1. That because of electronic communication it is not necessary or even desirable to assemble the student body in one room.

2. That either because of Item 1, a fixed stage is unnecessary or can be replaced by a portable stage in the round or a folding rectangular platform.

3. That basketball and volleyball are banned, if not altogether then at least to the extent that they cannot be played outside when and if weather permits.

And here again I quote from the Hall-Dennis report.

"Recognition of recreational pursuits and physical development should emphasize the aesthetic, social and physical rewards of such experience rather than team engagement and spectator participation".

Should these assumptions be accepted the results can be startling. To illustrate I have the example of an addition now under construction and consisting of a general purpose room, 2,000 square feet in area with a stage 14'-10" deep by 32'-6" wide. The contract price for this structure is $69,354.00.

If this amount is related to a structure having no fixed stage and a ceiling height of 10'-0" I have calculated that it is possible to construct a clear functional floor area of 3,680 square feet at the same cost. If 320 square feet is allocated to storage a net functional floor area of 3,360 square feet is possible. Please keep this area in mind. I will return to it.

While only a person much more qualified than I can define the character and infinite faucets of children from Grades one to eight, I venture to say that there is a blurred but noticeable division between children in Grades one to four and those in Grades five to eight.

In their paper dealing with Primary Grades Messrs. E.B. Davidge and L.B. Smith say that Primary children

"are wriggly, peppy, eager, and questioning. They love to run, jump, skip, dance, hop, climb, throw, catch, slide, fall down, and get up. They have a vivid imagination, and can pretend to be anything or anybody. They are individuals, not interested in being on a team or waiting for turns, but want to be active themselves.

At this age, the heart and lungs are smallest in proportion to body size. This means that vigorous activity is needed for muscular development and for increasing endurance, but that frequent rests are necessary, as the children tire easily.

They need activities where they can climb, jump, pull and stretch. Hanging ropes, tumbling mats, and balance benches are three of the most useful types of apparatus".

Agility apparatus is one of the best pieces of equipment for use from kindergarten to grade four. It offers a great many opportunities for the children to climb, jump, pull, twist and stretch. It also gives the children the opportunity of making up their own pattern of movements, so that they are conscious not only of having fun, but of how they are using their bodies.

I suggest that one half the new found area of 3,360 be allocated to these children and because they do what they do and then must rest I would perhaps cover a total of 1,680 square feet and the adjacent walls to a height of 6'-0" with fire-resistant carpet or other resilient material. I would install unbreakable windows.

A movable partition could divide the primary area from the remaining 1,680 square feet allocated to the upper grades.

To add flexibility an additional movable partition could divide the pirmary area into two smaller areas for diversified use as required.

While the proposition I have proposed may be small, unsophisticated, good or bad, it does illustrate that even a simple change involves many people: such people as the educator, health and recreation experts, the School Plant Approval Branch, Grants Department, the architect, manufacturers and others I hope it will suggest that we should forget where we have been and look to where we are going. The hardware will follow.

MUSIC FACILITIES IN SCHOOLS by Mr. J.A. Coles

The more I investigate this question of music facilities, through reading, through talking with colleagues, through my visits to schools, the more one basic point of agreement comes to the fore, and that is that before there can be effective planning in design, construction, etc., there must be in the words of the Music Educators National Conference Committee on Music Building, Rooms and Equipment "a general consensus as to the basic philosophy underlying the educational program in the community and the nature and extent of the curriculum that arises from that philosophy. There can be no single solution or set of solutions that will prove ideal in every situation. A physical plant will be successful in meeting the needs of a given school only when it is designed in terms of the particular educational philosophy of the community and when it provides sufficient flexibility to accommodate reasonable modifications in that philosophy. With which in mind, the necessity for a strong, balanced music program must be demonstrated logically and convincingly by the music educator".

Well then, how does one demonstrate this necessity? Why Music? Why in the school curriculum? An obvious but rather superficial answer is that if music were not in the school curriculum it would be about the only place in present day life where it was not to be found. Movies, radio, T.V. create an environment in which music is an omnipresent reality. It cannot be ignored or evaded without retreating completely from modern life and it is interesting to notice attempts being made to at least regulate it in public places. The Toronto subway ads which say: "If you must play your radio, please use your ear phones. But it is not simply the fact of its omnipresence which creates for music a unique place in the school curriculum. In the words of the Honourable William G. Davis, Minister of Education for Ontario, " music has a special role in the

educational process, for it can communicate directly to the individual without explanation or exploration; it can transmit and stimulate ideas and emotions; and it is a language common to people of all cultures. It is a fundamental component therefore, in the school experience of children". Or as expressed in "The Tanglewood Declaration", a statement which arose out of a symposium of philosophers, educators, scientists, labor leaders, philanthropists, social scientists, theologians, industrialists, representatives of government and foundations, music educators, and other musicians who gathered together in 1967 to examine the theme, "Music in American Society": "We believe that education must have as major goals the art of living, the building of personal identity, and nurturing creativity. Since the study of music can contribute much to these ends, we now call for music to be placed in the core of the school curriculum".

Which indicates that we've come a long way from the "frill" concept of music in the schools. As a matter of fact, looking at the matter historically, we came a long way to the frill concept--or perhaps we should simply express it as a momentary aberration along the way. Certainly the idea of music as core curriculum is anything but the invention of modern day educators; it is ancient and time-honoured, dating from the civilization of the Greeks.

Looking at our present situation in Ontario schools we find music to be a compulsory subject in elementary school and an option in secondary school. Vocal music is the basis of the program in elementary schools as it was in secondary schools up to the post-war years, when instrumental music began to be introduced as an intra-curricular subject. Increasingly also, instrumental music is being introduced into elementary school programs.

I think in the course of the development of school music programs, music has been taught just about everywhere in school. One of the first schools in Ontario to introduce instrumental music into the timetable was North Toronto Collegiate and I believe the original instrumental music room was an only somewhat renovated section of the boiler room. My friend and fellow Program Consultant Leonard Dunelyk who is with me here this morning will recall this well since he taught at North Toronto Collegiate in these early days. Music has also been taught in lunch rooms, gymnasiums, auditoriums, hallways, and washrooms. Washrooms, incidentally, have marvellously interesting acoustics for making music. They provide one of the surest ways I know to make your barbershop quartet sound like the Don Cossack Chorus.

Today we have some very good music rooms throughout the province. We have also unfortunately, some rooms which although quite splendid from the visual standpoint, are not very good places in which to teach music because certain fundamental practical considerations were not taken into account when they were built.

Which points to the fact that the music educator should be given an important voice in the designing of music facilities. It is particularly essential that he be consulted early in the planning stages and that his opinions be sought periodically thereafter. The board of education has an obligation to consider very seriously the suggestions that he contributes as has the architect.

It is, of course, necessary to add that it is equally important that the music educator be aware of the problems of the architect and administrator. The teacher should not hesitate to ask for the equipment and facilities that he needs, but he must be realistic in his requests and able to justify them. And he must understand that the board of education, which is subject to pressures from many sources, must reconcile the divergent interests of various parties, including the taxpayer.

At this point I should perhaps make it perfectly clear that I speak only as a music teacher. I claim no particular insight into or expertise with regard to matters such as design, construction, or acoustical properties. My approach to these questions stems from my reading, my own practical experience as a music teacher, and my observations of others at work in music classrooms.

With which in mind I find it most helpful to refer to three checklists provided by the previously quoted Music Educators Committee on Music Buildings, Rooms and Equipment. Here are those checklists for your consideration:

CHECKLIST FOR THE DIRECTOR OF MUSIC

(or Other Music Person Involved in Planning a Music Facility)

1. Have you and the teachers involved in the new building developed a philosophy of music education?

2. Does this philosophy reflect the newest ideas in music education so that you will be building for the future?

3. Do those who will carry on the instruction fully understand their roles in the program of music education?

4. Have these teachers been given the opportunity to request facilities that would make it possible for them to do their best teaching?

5. Have you made the architect fully familiar with the type of program you want to carry on in the new building?

6. Have you given the architect your best estimates of the numbers of people involved in each phase of the music program?

7. Have you indicated to the architect any special requirements in acoustics, lighting, location, heating, humidity control, etc., that are necessary to your program?

8. Have you worked with principal to determine how the music activities will be scheduled in the new building?

9. Have you determined the equipment which will be needed to make the new facility functional?

CHECKLIST FOR THE ADMINISTRATOR

1. Have you developed a general philosophy of education for your school?

2. Does your music staff understand this philosophy and their place in the overall program?

3. Have you determined the type of schedule the new school will follow and made certain that the music staff understands its implications for the music program?

4. Have you helped the music staff estimate the enrolments in the various activities planned in the music program?

5. Have you projected these enrolments for at least a five year period in order to build for the future?

6. Have you and the music staff considered the implications of community involvement in music activities?

CHECKLIST FOR THE ARCHITECT

1. Have you visited a school with a music program such as that desired in the school you are to plan?

2. Have you met with the music staff to find out just what it is they want to do in their teaching?

3. Are you familiar with the special problems of acoustics, lighting, sound transmission, traffic control, and humidity control which are associated with music teaching and public performances?

4. Are you prepared to suggest new ways for physical facilities to assist the music staff in reaching their objectives?

Let us now consider various of the practical considerations that need to go into the planning of a music room. I will attempt to hit on what I consider to be the high points.

1. The question of where: Near the auditorium is desirable as is an outside access. Room should be isolated from other teaching areas, especially if the school's design is based on the open concept plan.

2. The question of size and shape: Instrumental music rooms should be large enough to accommodate the largest band or orchestra using the facilities. The size of these groups varies across the province, but sixty to eighty is a reasonable estimate. Some schools have instrumental groups of one hundred or more performers and this should not be considered impractical. For instrumental music rooms, 24 square feet of floor space per pupil is recommended, for vocal rooms 18 square feet. An example of one school system's approach to space requirements is a minimum of 1200 square feet for a vocal room and 1800 square feet for an instrumental room as used by the Toronto Board of Education.

Ceiling height is most important in terms of the room's acoustics. Regular classrooms with low ceilings parallel to the floor are acoustically poor for large group music making. Height may differ at various points of a music room since the ceiling may be sloped or scallop-shaped or contoured in a variety of ways. Also, the floor may have different levels of risers. For these reasons, the best guide is <u>average</u> height and this should be between fourteen and eighteen feet for an instrumental room and between twelve and sixteen feet for a vocal room.
Incidentally, combined vocal-instrumental rooms are <u>not</u> recommended.

3. The question of additonal space requirements: practice rooms are essential in modern music facilities and the concept of practice rooms needs to be very broad, embracing as well as rooms in which individuals practice, rooms that can be used for individual instruction, small group instruction and small group rehearsal. Where programs of independent study are followed, it becomes increasingly important to provide special facilities for music listening.
A music office and, for instrumental music, a repair room are worthy of serious consideration.

4. The question of what goes into the music room: risers are definitely recommended for vocal rooms but opinions differ as to their use in instrumental rooms. Proponents cite pupil-teacher eye contact, less obstructed sound and overall control as advantages while opponents claim a lack of flexibility in seating arrangements and that brass and percussion tend to overpower other instruments when there are risers. If risers are used in instrumental rooms two features, in my view are essential: first that the width of the risers vary as to the instruments which will be played on them, second, that they be insulated in such a way that they do not amplify the sound of the instrument being played on them (e.g. bass drum, bass viol). I and my Music Consultant colleagues with the Department of Education strongly recommend that instruments be kept in open shelving around the perimeter of the music room rather than in a separate instrument storage room. Traffic problems are alleviated and repair bills are reduced if this is done.

Music rooms should also include the following:

- a chalkboard, at least one panel of which should have staff lines for musical notation
- a large bulletin board
- shelves for students' books so located as to avoid traffic jams
- storage racks for music folders
- in instrumental rooms, non-folding music stands with a heavy base
- music console with stereo tape recorder and stereo record player
- microphones for taping.

5. The question of temperature and humidity: Temperature of 65-74 degrees Fahrenheit and a moisture level of 40-50% is recommended for most confortable performance, instrumental and vocal, and in the case of musical instruments in a room, to avoid drying and cracking.

6. The question of acoustics: the main factors affecting the acoustics of a music room are those of size and shape as mentioned earlier. Some other considerations are as follows:

    1. For noise control, doors should be heavy and solid with edges well sealed, and an independent duct system is advisable. Windowless rooms are considered best but if windows are used, two thin panes are preferable to a single thick pane.
    2. Sound diffusers on otherwise flat surface areas of walls and ceiling help to balance sound in a music room.
    3. Corners should be rounded off. e.g. corners of practice rooms, music office.
    4. In order to avoid flutter echo one pair of opposite walls should not be parallel. This applies also to practice rooms.

THE ACOUSTICAL ENVIRONMENT IN A SCHOOL by Professor V.L. Henderson

ABSTRACT

"Every room is an acoustical problem" - some more than others. Among the some are auditoria, music rooms, special classrooms.

In auditoria the listener should not be disturbed by undesired sound - noise, nor should occupants of other rooms be disturbed by noise eminating from the auditorium. The program sound should be evenly distributed to the audience. The decay of sound (reverberation) should be controlled both when the auditorium is empty and when the audience is present.

Music rooms are extensions or replacements for the stage of the auditorium, and should acoustically duplicate it as closely as possible. This is beyond the powers of the acoustical designer if he is presented with blackboards, tackboards, storage racks covering every space where he might locate acoustical control material.

Special classrooms include those where hearing conditions are most critical, and those where noise is a product of the program. Each of these can be benefited by care in the acoustical design.

In order that the acoustical problem presented by these rooms can be solved most effectively and efficiently, the acoustical design must bear equal weight with that of aesthetics, maintenance, housekeeping, and must be given full consideration from the first instant that planning is commenced.

THE MEDIA CENTRE by Mr. N.A. Best

1. Flexible Patterns and Organizations for Learning

   a - Traditional
   - i teacher with approximately thirty pupils in class
   - ii pupils grouped into usually three groups according to abilities and interests
   - iii individual pupil work as member of small group or of whole class

   b - Current
   - i large groups for common instruction of approximately 100 pupils
   - ii seminars of approximately 15 pupils for discussion and group investigation
   - iii individual pupil work

   c - Significant emphasis on individual learning
   - i motivation for learning necessary
   - ii many activities and investigations simultaneously

2. Individual Instruction or Individual Learning (?)

   a - Each pupil with purpose for learning
   - i not only a general purpose but a specific interest or need for knowledge
   - ii motivation from self, from teachers, from peers in group

   b - Each pupil with skills of individual learning
   - i language skills
   - ii research skills (even in primary grades)

   c - Availability of Learning Materials
   - i in the classroom
   - ii in the media centre

3. The Media Centre - a data research and distribution area

a - Many names - library, resource centre, learning materials centre, etc.

b - Major area -
- i available to students, teachers, and paraprofessional help
- ii media of all types available for research and distribution
  - books, pictures, pamphlets, periodicals, filmstrips, tapes, records, 8mm. film loops, etc.
- iii physical facilities to display and distribute all media for use in the centre or outside
  - furniture, carrels, electrical connections, computer connections, etc.
- iv flexibility of arrangement
- v ample size
- vi centrally located in school building
- vii a pleasant place to be
- viii suitable for seminars or group meeting

c - Minor area - a production and maintenance area
- i a workroom for teachers, technicians and sometimes students
- ii smaller than basic research and distribution area, but with easy access to main area
- iii basic functions - preparation and maintenance of teaching and learning materials - e.g. -
  - preparation of transparencies for overhead projector
  - photocopying of documents, etc.,
  - copy-stand photography -
  - making of charts, graphs, map enlargements, etc.,
  - basic cataloguing. (when not done in central library)
  - picture mounting
  - receiving and distributing of 16mm films from central film library
  - simple repairs to books and equipment
  - tape duplication
  - local distribution of ETV via VTR and closed-circuit TV
  - storage of basic equipment

THE LEARNING MATERIAL CENTRE by Mr.B. Quan

SPEAKER'S TOPIC:

"Physically Providing for Contemporary Media Facilities"
(Hardware & Software)

SCOPE & RESUME:

1. History & Trends - Media, Materials, Equipment and Space:
   - a) Old and Contemporary
   - b) Utilization
2. Physical Requirements:
   - a) Service Facilities
   - b) Environmental Needs
3. Construction Requirements:
   - a) For Installation Now
   - b) For the Future
4. Cost of Facilities:
   - a) Immediate
   - b) Provisional

1. History and Trends -- Media, Materials, Equipment and Space:

   a) Old --- (Essentially Visual)

      -- Books and other Printed Matter (Library)

      -- Slides and Film

   Contemporary --- (Audio-Visual) and (Special)

b) Utilization --

   i) Purpose --

      -- Storage

      -- Maintenance and Repairs

      -- General Use

      -- Reproduction

   ii) By Whom

      -- Teacher/Custodian

      -- Individual Student

      -- Special Groups

      -- Class or Classes

2. Physical Requirements:

a) Service Facilities -- (flexibility paramount)

   1) <u>Furniture</u>
   Shelving, Tables, Carrels, etc.

   2) <u>Electrical</u>
   Outlets & Raceway Systems
   (including underfloor)

   3) <u>Special</u>
   Water, etc.

b) Environmental Needs --

   i) Space -- Areas and Rooms

      -- Library Space

      -- Special Materials Centre

b) Environmental Needs (Cont'd)

-- Work or Production Space

-- Storage Space

-- Assembly Space

ii) Zoning -- Partitioning

-- Location

-- Privacy and Isolation

iii) Climatic -- Comfort

-- Heating

-- Ventilation

-- Air Conditioning

iv) Audio - Acoustical

-- Ceiling Tiles & Wall Panels

-- Carpets & Drapes

v) Visual - Lighting

-- Natural

-- Artificial

-- Book Shelves & Catalogue Files

-- Reading Tables

-- Carrels

3. Construction Requirements:

a) For Installation Now --

-- Readily incorporated as an integral part of the building. Primarily a space and electrical problem.

-- Flexibility must be considered.

b) For the Future --

-- If equipment is not being purchased now, it is important to make some provisions for the future, to minimize major alterations. It may be difficult to make satisfactory provisions.

-- Services may be installed as Stage 1 before equipment is purchased at a later date as Stage 2. e.g. TV system

4. Cost of Facilities:

a) Immediate --

-- Costs are minimized when services are incorporated at the time of construction.

-- Additional expense is necessary to obtain maximum flexibility.

b) Provisional --

-- Provisional requirements may be adapted to fit a particular budget, although results may not be entirely satisfactory.

RESUME

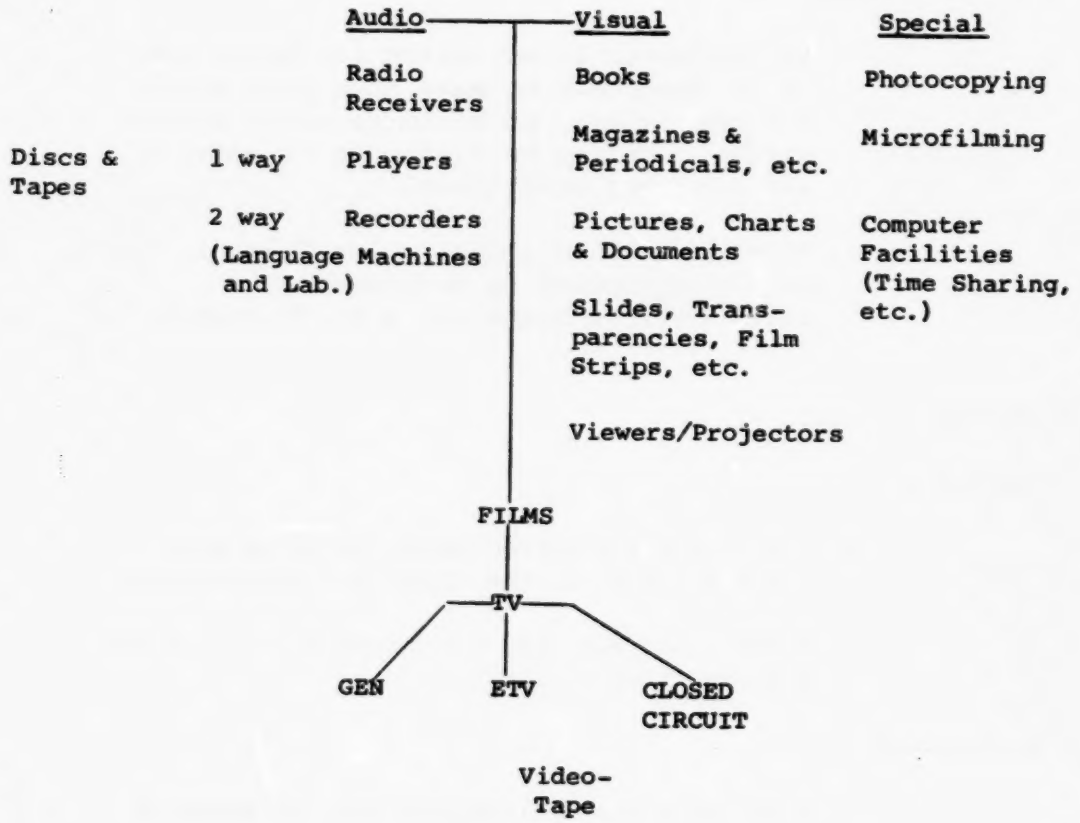
1. History and Trends -- Media, Materials, Equipment and Space:

   a) Old --- (Essentially Visual)

      -- Books and other Printed Matter (Library)

      -- Slides and Film

      Contemporary --- (Audio-Visual) and (Special)



   b) Utilization --

      i) Purpose --

         -- Storage

         -- Maintenance and Repairs

         -- General Use

         -- Reproduction

      ii) By Whom

         -- Teacher/Custodian

         -- Individual Student

         -- Special Groups

         -- Class or Classes

2. Physical Requirements:

   a) Service Facilities -- (flexibility paramount)

      1) <u>Furniture</u>
         Shelving, Tables, Carrels, etc.

      2) <u>Electrical</u>
         Outlets & Raceway Systems
         (including underfloor)

      3) <u>Special</u>
         Water, etc.

   b) Environmental Needs --

      i) Space -- Areas and Rooms

         -- Library Space

         -- Special Materials Centre

CONSTRUCTION SYSTEMS FOR SCHOOL BUILDINGS by Mr. J.C. Rankin

A SYSTEM - What is it?

Everyone has his own definition or at least his own understanding of this phrase. It would appear that it is not only fashionable but essential to have a special language these days. In order to clarify this discussion it might be well if we could agree on a definition which it is proposed might be:

A system is a working totality formed of often diverse but integrated parts subject to a common plan or serving a common purpose. A system can be very complex or it can be very simple, it can be a guided missile and its control centre - a child's play with a skipping rope. I believe that we must go further and consider other sub-divisions and suggest that when we are talking about a building system we are talking of hardware and when we are talking about the systems approach we are talking about a management approach a technique or discipline.

The systems approach is in reality a thorough following of five steps.

System definition
System analysis
System design
System implementation
Final evaluation

When this is applied to the built environment the systems approach means effecting a constant integrated and reasoned pursuit of a program from the instant a need is conceived until it is physically satisfied and the satisfaction documented. If that sounds like a rationale for deliberately planned sex - it depends on whether you use the systems approach.

Having defined the systems approach we should perhaps look at the results of different interpretations and uses of the method. Today we can examine briefly two different programs and we have the unusual opportunity here of viewing the child before the parent. The SEF program to which we are now addressing ourself is in some very real ways a stepchild of the CLASP program. Very briefly the history of the SEF program may be stated as follows:

In 1963 the Honourable William Davis, Minister of Education for the Province of Ontario called together a conference on School Planning and Design. Held in Toronto it was attended by some 1600 people representing every discipline both inside and outside the education system who are concerned with the problems. As a result of this conference it was decided that a major effort must be made to investigate the requirements of education for the future and of methods to satisfy the need. It was further decided that the urban conglomerate which is Metropolitan Toronto provided an ideal location for this kind of study because within its boundaries it offered examples of nearly all the problems facing education from scattered sporadic development of previously rural property to the highly concentrated urban redevelopment. There were many more people available within short range for consultation than in any other location in the Province of Ontario. Two things happened-a Minister's Advisory Committee on School Design was instituted headed by Dr. K.F. Prueter and a Division of School Planning and Building Research was set up within the Department of Education headed by Mr. F. Nicol. These two groups drew to the attention of the Metropolitan Toronto School Board the experiment in education facilities that was then taking place in Southern California known as SCSD and established to the Boards satisfaction that this was a major effort which represented a significant change in the approach to school facility provision. The Metropolitan Toronto School Board set up an Advisory Committee representing the City and Borough Boards of Education the National Research Council and the Design Professions in the words of the minutes of the meeting of November 5, 1965 to undertake a Major Study of School Building Practices in Metropolitan Toronto with particular reference to -

(a) development of systems and components specifically for school use
(b) more effective application of principles of modular construction in achievement of greater flexibility of interior design.

The Advisory Committee approached Educational Facilities Laboratories in New York who had underwritten the research costs in the SCSD project and requested their assistance in the Metropolitan Toronto Research Project. SEF happily has had the full support of Educational Facilities Laboratories - its staff and their advisory capabilities as well as a very significant financial contribution. EFL has underwritten 1/3 of the total costs of the SEF project. The Advisory Committee then set up a staff to undertake the project and appointed Mr. Hugh Vallery as Academic Director and Mr. R.G. Robbie as Technical Director. There is a joint Research Director, Dr. John Murray. The academic research staff consists of four senior and four junior researchers, the technical staff two senior and two junior researchers plus a secretariate. The premise on which SEF has functioned is that the need must be defined as accurately as possible and the requirements stated in terms of required performance.

The physical facilities which we now expect to form the parts of the First SEF Building System have been a magnificent response by the construction industry to a detailed performance specification. I must point out that no research done by SEF was basic, fundamental research. SEF concerned itself with researching into precedent, reading the literature that was available produced anywhere in the world, visiting many schools in all parts of North America and presenting this material to a series of academic and technical committees for their comments and assistance. To date some two hundred and fifty teachers, principals, superintendents, coordinators and directors have cooperated in the academic side of the program and on the technical performance specification preparation some one hundred practicing professionals, plus representatives of over four hundred manufacturers, contracting and sub-contracting organizations and the building trades unions have all made significant contributions. The final results which SEF received in the form of tenders on the 7th January 1969 represented the efforts of thirty-six companies. It has been estimated that the construction industry invested some 3.6 million dollars in responding to the SEF specifications. How was this done? Why? The answer is very simply that school construction in Metropolitan Toronto is big business. The average budget for capital works in Metropolitan Toronto area has exceeded seventy million dollars a year for the last several years and that amount in every case represents a significant cutback from the original statement of requirement which would run anywhere from one hundred and one to one hundred and sixty-seven million dollars and these ladies and gentlemen are annual requirements for capital expenditure.

It has been estimated conservatively that the capital budget for the next ten years in Metropolitan Toronto would have to exceed five hundred million dollars. Following the SCSD example in Southern California the Metropolitan Toronto School Board assembled a package of school buildings. The City of Toronto and the Borough School Boards nominated into the SEF program thirty-two buildings and the Metropolitan Toronto School Board offered to the construction industry a contract for not less than one million square feet and not more than two million square feet of school construction for completion in the calendar years of 1970 and 1971. With this as the initial contract and the ongoing school program as a very real home-grown market the construction industry responded magnificently.

To what did they respond?
SEF arbitrarily divided education buildings into eleven parts. These were structure, atmosphere, lighting-ceiling, interior space division, vertical skin, plumbing, electric-electronic, caseworks and furniture, roofing, interior finishing and a host of uncoordinated items which were called non-system. The first ten categories were called sub-systems. These were carefully studied and with the assistance as mentioned earlier of specific technical consultants and generous participation of the whole construction industry, a set of performance specifications was produced. Tenders were invited from prequalified sub-system contractors on the 9th July last year. The results have been beyond the wildest dreams of most of those dealing with physical school facilities. It is estimated that the requirement as stated in the specifications which represents a substantial increase in the quality of school facilities if applied to or responded to in the traditional design method in the Metropolitan Toronto area would require an increase in budget of 25% to 30%. Items such as all year round air conditioning, carpeting in over 60% of the area, clear spans up to 65 feet for floors and greater than that for roof construction. The response has been such that it appears that schools can be constructed using the First SEF Building System for a minimum saving of 5% of the current ceiling cost formula of Metropolitan Toronto with intelligent planning up to 18% saving might be achieved. One point that must be made abundantly clear is that the First SEF

Building System is not a standard plan, it is not a standard building: it is a very sophisticated kit of parts that can be put together by the design professionals in an almost infinite variety of ways. Because of the fact that the system can be assembled so many ways obviously some of these are less efficient than others and for this reason it is impossible to say that the cost will be any particular number any more than it is possible to be definite using traditional methods and materials right now. One of the conditions that SEF considered to be most important in its tendering requirements was the requirement of interfacing by the Sub-System Tenderers. This was a requirement in the specifications that Sub-System Tenderers whose materials abutted one another must jointly decide on the exact line of division between sub-systems and establish to their mutual satisfaction who does what and in addition it was a requirement of SEF that the tenderers do this with at least two tenderers in every one of the mandatory interface categories. As a result when the tenders were evaluated it was necessary to enlist the assistance of a computer. Potentially there were well over one million possible combinations. Bearing in mind that a lack of time prevented some people from interfacing with everybody in a thorough manner the number was reduced. However, the number of viable combinations in other words, the number of complete building systems that was offered to the Metropolitan Toronto School Board was in excess of 13,000 everyone of which met the performance specifications of SEF. The hardware that has been presented to SEF represents a very careful analysis of the construction problem and the solutions generally speaking represent an organizational breakthrough rather than a technical breakthrough.

The structure is a steel joist and truss combination using a constant depth throughout the span range and a constant finished column dimension over the fireproofing. The roof deck is a traditional metal roof deck and the floor, a metal pan with a concrete slab topping. Wind bracing is achieved by x-bracing in fact a thoroughly traditional solution.

The Atmosphere sub-system consists of a series of individual electrically fired or operated units designed primarily for roof top mounting but with the capability of being installed in spaces adjacent to the exterior of a building. The units have a 10,000 CFM capacity approximately and deal with a variable percentage of fresh air. Each unit is entirely self-contained and includes heat generation, refrigeration, humidification, filtration and controls the space temperature to within + or -2^{o} of a 6^{o} spread on a year round basis in spaces of 400 square feet or more.

The Lighting-Ceiling Sub-System is based on the five foot by five foot planning grid which SEF adopted. It provides lighting, acoustic attenuation and absorbtion at two levels, six different categories of lighting, as well as incandescent lighting for specific purposes such as exits, displays, etc. General illumination is being provided to the learning spaces using only 2 watts per square foot in place of the average traditional four watts per square foot. This lighting is controlled in two levels so as to allow note taking during audio-visual presentations. The lighting-ceiling sub-system provides the fire membrane for the structural sandwich the floor-ceiling sandwich as well as providing the diffuser the boot and the fire damper for the atmosphere sub-system.

The Interior Space Division offers three basic types of interior walls. Those that are relocatable such as are found in many office buildings today. Those that are operable are the accordion type or panel type movable walls and also fixed walls which have a fire rating. The vertical skin a precast concrete one has a series of panels from which the designer selects. The system is erected by first attaching the spandral panels to the columns and the infill panels then span from floor to ceiling. It may interest you to know that the size of the glazed opening that is being offered is based on the air conditionings capabilities rather than on any other basis.

The Plumbing Sub-System is a rationalizing of the use of equipment and a considerable amount of prefabrication of the plumbing tree for the SEF project. You can have any basin you wish as long as it is white and is the one offered. By limiting the selection to one of each type of plumbing fixture there has been substantial gain to the purchaser.

The Electric-Electronic Sub-System is perhaps the most

exciting of those developed in response to the requirements of the SEF program. It includes power and communication wiring within the occupied space. Primary electrical service transformers and the main switchboard are non-system but beyond this the electrics are all under one contract. Distribution points are set up at approximately sixty foot centres in both directions throughout the building and everything from there out will be done by plug-in pieces. Certain testing remains to be done but we have been very fortunate to have excellent assistance and cooperation of the Ontario Hydro. The communication system includes the normal public address and paging systems program and clock systems room to room inter-communication local sound reinforcement and even fire alarm signalling.

The Casework Sub-System was not tendered at the same time and the specification for this sub-system is currently being reviewed and commented on by the building industry. It is planned that this will be tendered soon with the closing during the summer months and after testing an official contract may be awarded in the early fall.

The Roofing Sub-System is a rationalizing of the current roofing practices and does not offer anything radically new except a very tidy flashing detail, roof to wall all I might add, at a very attractive price.

The carpet which we have been offered is a polypropelyne material that was developed specifically for the SEF program. It is accompanied by a six year guarantee for both material and installation.

The Gymnasium Flooring material that will be used in the SEF system is a resillient material which we believe to have any properties superior to that traditionally used and the educators are particularly enthusiastic.

A test structure is being erected as an addition to Eastview Public School in Scarborough, Ontario and this addition should hopefully be completed in the early part of July of this year. During the month of July it is intended to carry out extensive testing of the addition to ensure the compliance of the system with all SEF specifications and the SEF Technical Staff has every reason to believe at this date that there will be no serious difficulty.

We would be remiss if we considered the building system successful as it appears to be. To be a final answer SEF believes that this is the first step in the evolution of the provision of physical facilities for education and indeed for all of society's needs. Evaluation of the results should point the way to newer concepts of what is reasonable and possible for the next step. Perhaps the most significant experience that those of us at SEF have had in the past two and half years is the integration of the user in the facilities process. The clearly stated definition of requirements has been fundamental; and the participation of all parties in the system analysis, system design and the implementation has led us to the point where we believe that final evaluation will point out an irreversible pathway for the future.

CONSTRUCTION SYSTEMS FOR SCHOOLS by Mr. S.J. Solomon

"C.L.A.S.P."

A building system has been defined as a method of building that justifies a brochure. There is a lot of truth in that but perhaps it would be fair to define it as a method of building that has been allied to some form of organization for its economic exploitation. A bit dry, perhaps, but you will note that this gives as much emphasis to the organization backing it as to the method itself and I think rightly. The importance of the organization in system building has been particularly evident in the U.K. over the last ten or so years where so many good ideas have been floundering around looking for a sponsor. These start in the heads of architect or engineers but never materalise because the designers cannot persuade either client or building of their potential. The client wants to deal with an organization with sound financial backing and the guarantee of service to go with it, and the builder wants some sort of guarantee that there is a market for it. Because of the fragmented nature of client, professional and builder's organizations, the three rarely come together.

It will be useful to spend a little time categorizing systems from the viewpoint of the sponsor's organizations. One can identify three main groups. Firstly, there are the systems sponsored by manufacturers of building products or components. Their motive for launching a system is usually to create an extension to their normal market. Such systems tend to suffer from their lack of site expertise. While the production and design quality of the components is usually good, the process of putting them together on site is often not worked out to achieve maximum efficiency. An exception to this, which you are doubtless familiar with, are the systems for moveable classroom units where the amount of work on site is cut to an absolute minimum.

Another disadvantage of the manufacturer's system is that it usually means some special tooling and the manufacturer finds it difficult to amortise his tooling costs, in particular during the 'stop' part of the familiar 'stop-go' cycle in building activity. During the 'go' part of the cycle there is full employment in the building industry and systems score by the fact that they use labour more productively. It is during periods of under-employment that systems suffer and manufacturers are tempted to cut their losses and quietly buy their promising new creation.

The system sponsors in the second category are rather more resilient. These are the builders. In the field of housing, it is usually the builders who launch new systems, the systems usually being either a rationalization of the building methods they have been using for many years or, as has often happened in the U.K., a high rise concrete system licensed from the Continent. These systems tend to be more resilient because they are often treated as a side-line to the builder's main activities and little is lost in times of low demand as the builder can leave his system in cold storage while he concentrates on traditional building.

Builder-sponsored systems are naturally good on site productivity, using efficient techniques backed up by sound site organization. They are usually less good on efficiency of component design related to factory production. Sometimes the builder will manufacture his own components and this is particularly common in low-rise housing systems, but the components are usually designed with the builder's own workshop facilities and craft labour in mind and they are thus largely traditional in concept.

Very occasionally builder and manufacturer act as co-sponsors of a system, resulting in factory production expertise geared to an efficient site organization. However, there is one factor that this set-up still lacks and that is a clear lead on user requirements. A system sponsor runs the risk that, by broadening the appeal of his system to try to cater for as many clients as possible, he succeeds in satisfying none of them.

My third category of sponsor, the client, has no difficulties on this score. The system development team set up by the client usually undertakes an appraisal of client needs and user requirements before embarking on the design of the

bits needed to meet them. The S.E.F. Project in Toronto is an example of a client sponsored system with the difference that the technical team have stopped short of actual component development and have concentrated on defining user requirements and setting-up the framework to enable the building industry to design the parts. I would like now to describe one of the best known of client sponsored systems, namely CLASP.

This was one of the first client sponsored systems and certainly the first to bring together several clients into a Consortium in order to build up a viable building programme. The system was designed initially to solve the problems of school building in the County of Nottinghamshire, development work commencing in 1955.

The problems were acute. There was a severe shortage of skilled labour, traditional schools were taking too long to build and, being one-off solutions, were not amenable to cost control. Another problem was that subsidence due to coal mining was necessitating special foundations that was forcing the Ministry of Education to allow such schools up to 10% additional grant.

After a period of user study, the initial system development was completed in six months and the prototype school opened six months later. Building time was halved, a framework for future cost control was set up, and the 10% additional grant for a subsidence site was handed back to the Ministry. Mining subsidence is incidental to the system and I refer to it merely as an example of how the analysis of client needs and development of a standard building method gives the opportunity to question certain assumptions about schools and building generally that can lead to significant savings in cost.

It was evident that Nottinghamshire's £1 million annual building program was not large enough to attract significantly lower prices from component suppliers, so other countries with similar problems were encouraged to join in. Thus was created the Consortium of Local Authorities Special Programme. The combined annual total of building value rose from £1 million in 1957-58 to about £20 million in 1967-68. Somewhere in between is the optimum size of program where the maximum benefit of price reduction due to bulk buying is achieved without exceeding the capacity of medium sized suppliers and thus reducing the numbers tendering.

The system consists of a pin-jointed steel frame, sitting on a concrete raft, to which are fixed timber upper floors and roof and various forms of cladding and windows. Apart from the fundamental re-appraisal of design for mining subsidence there was no attempt to do anything revolutionary. Design of details was based on function and the temptation to make emphatic statements was avoided. The success of these schools was due to the general excellence of environment they created. A poor architect using the system might produce a mediocre school but it would take tremendous effort to produce a really bad one. A system will inhibit the wilder fancies of an architect but provided the parts are sensitively designed it will prove an excellent means to good school design.

Interior views of typical CLASP schools demonstrate the high quality of finishes obtained. It is very easy to clothe the bare bones of a system with expensive finishes but here it has been achieved within normal cost limits by a striving on the part of the development architects to put the money where it can be seen. This bonus is possible in the client based system as the architect has full control of the design of the parts. The hidden elements such as the frame, foundations, floor and roof are stripped to their bare essentials leaving a bigger proportion of the cost of building free for such things as hardwood doors and frames instead of softwood and foam-backed vinyl floors instead of thermoplastic.

The biggest single project built in CLASP is York University, by Architects Robert Matthew, Johnson-Marshall and Partners. All of the £10 million scheme except the library and auditorium is in CLASP. The main reasons for the choice of CLASP were speed of erection and the fact that there was not sufficient building labour to cope with the university in traditional construction on top of all the other proposed building in the region.

The 100th CLASP project in Great Britain is at present being built. In the twelve years of its existence, the system has undergone constant re-appraisal and development with Mark 5, incorporating the change to metric, due in 1972.

In the 1961 Triennale Exhibition in Milan the British Pavilion, a typical primary school built in CLASP, won the Gran Premio Award. The Italians took some convincing that the quality of the building was typical of schools in Britain, but they were very enthusiastic and tried to persuade the British Ministry of Education to make the system available in Italy. Such a venture was outside the scope of a Government body, and the Consortium was too loosely knit a body to undertake such work. So the firm that was principally involved with the system, namely Brockhouse Steel Structures Ltd., was asked if it wished to launch the system abroad. The Brockhouse engineers had collaborated with the Consortium right from the earliest stages and the firm was then, and has been since, the sole supplier of the steel frame. About the same time as the Triennale Exhibition, CLASP was being considered for use in Germany for schools for the British Army of the Rhine. The Brockhouse Group set up companies in both countries and the system was adapted to suit local conditions. This meant taking into consideration such aspects as climate, building regulations, user requirements, available materials, level of quality, balance of building trades and so on. The Brockhouse company in each case performs roughly the same function as the Consortium does in Britain, developing the system, organizing the program, entering into agreement with local manufacturers for the supply of components and giving advice to architects and builders on how to use it. The technical development is done locally and is co-ordinated in all countries outside the U.K. by the International Division of Brockhouse Steel Structures Ltd.

This set-up really amounts to a fourth category of sponsor where a commercial firm takes over a system from the original client sponsor and provides the necessary organization to link client and architect with manufacturers and builders.

The Germans have produced a very refined version of the system which reflects the high quality that they demand of their buildings. The Italians, on the other hand, spend much less per pupil. When introducing the system into a new country, the design concept must be flexible enough to allow the parts to assume their correct level of quality.

About eighty-seven buildings have been completed in Germany and a similar number in Italy. The system is also established in France and Switzerland and, since last year, in South Africa.

An interesting project in France was the group of buildings in Grenoble built at great speed to be ready for the start of the last Winter Olympic Games. The buildings served as administration centre during the Games, and afterwards were handed over to the community as a secondary school.

The CLASP system has as many forms as the countries in which it exists. The form it will finally take in Canada has not crystallized yet, nor is it possible at present to forecast when it will be ready for use.